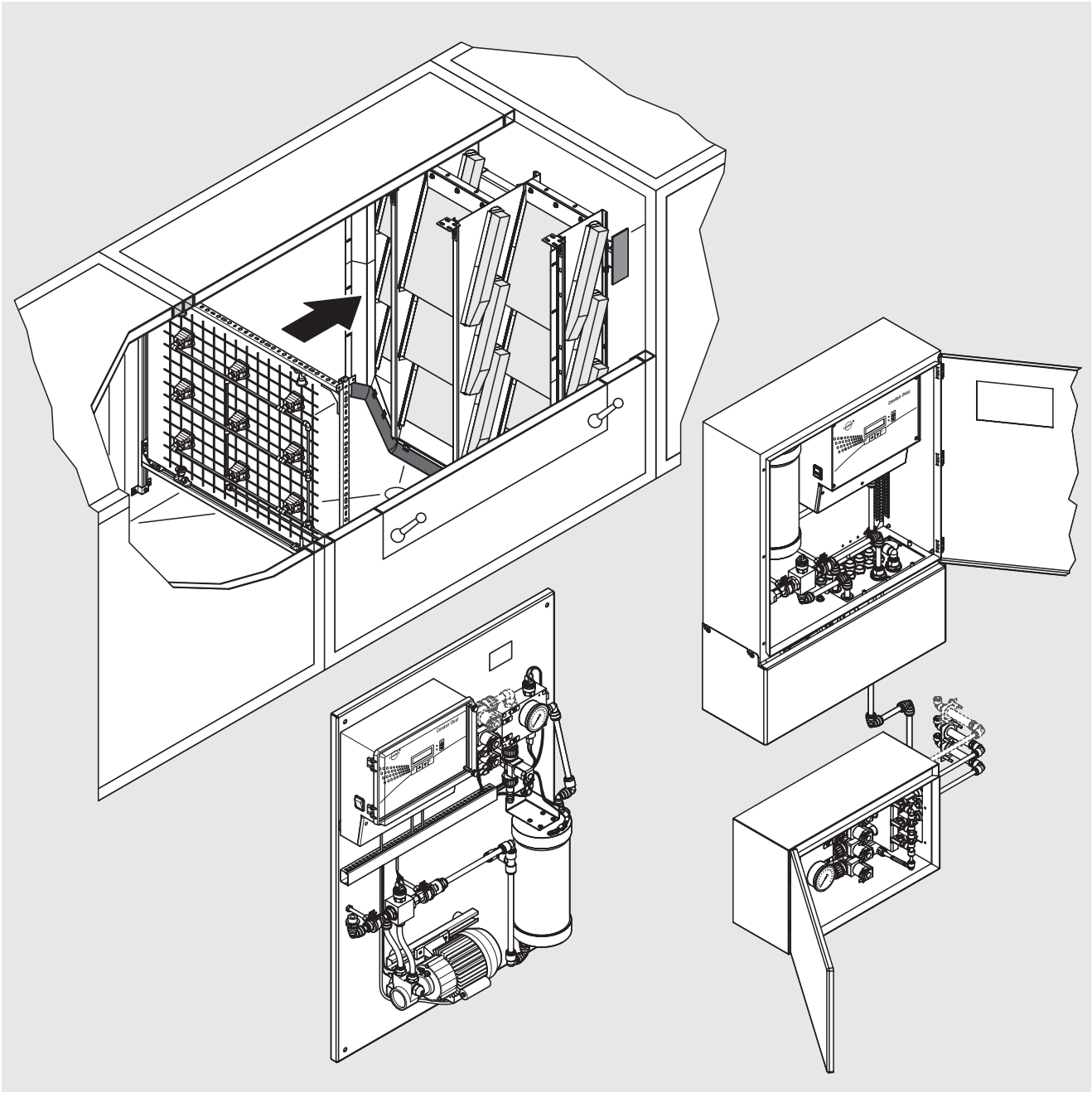
Hybrid Humidifier

Condair Dual 2

Installation and Operating Instructions



1120506 EN 0505

Contents

1	**Introduction**	**4**
1.1	To the very beginning	4
1.2	Notes on the installation and operating instructions	4
1.3	Spezialwerkzeug	5
2	**Important notes**	**6**
2.1	Correct use for intended purpose	6
2.2	Safety instructions	6
3	**Overview of the Condair Dual Hybrid Humidifier**	**8**
3.1	Basic design of the Condair Dual Hybrid Humidifier	8
3.2	Function	9
3.3	Scope of versions	11
3.4	Options	13
4	**Installation and first-time commissioning**	**14**
4.1	Safety notes for installation and commissioning	14
4.2	Installation of the humidification unit	14
4.2.1	Installation of the nozzle system	16
4.2.2	Installation of the post-evaporation unit	19
4.3	Installation of the central unit	35
4.4	Installation of the components of the decentralized system	36
4.5	Water installation	38
4.6	Electrical installation	42
4.7	First-time commissioning	44
5	**Operation**	**45**
5.1	Introduction	45
5.2	Commissioning for daily operation	45
5.3	Taking the humidifier out of operation	47
5.4	Inquiring operating parameters	48
5.5	Setting up operating parameters	52
6	**Maintenance and replacement of parts**	**57**
6.1	Maintenance safety instructions	57
6.2	Important notes on maintenance	57
6.3	Removal and installation of components	60
6.3.1	Removal and installation of ceramic plates	60
6.3.2	Removal and installation of the spray nozzles	62
6.4	Replacement of silver ionization “Hygieneplus”	63
6.5	Replacement of the control unit fuses	64
7	**What if ...?**	**65**
7.1	Error messages	65
7.2	Failures	68
7.3	Instructions for fault elimination	69
8	**Specifications/ambient conditions**	**70**
9	**Appendix**	**71**
9.1	Notes on humidity control	71
9.1.1	Notes on humidity control with the internal PI controller	71
9.1.2	Enthalpy control for Condair Dual	73
9.2	Declaration of conformity	75
9.3	Commissioning protocol/Maintenance record	75
9.4	Setup table silver ionization “Hygieneplus”	78

1 Introduction

1.1 To the very beginning

We thank you for having purchased the **Condair Dual 2 Hybrid Humidifier** (abbreviated as “Condair Dual”).

The Condair Dual Hybrid Humidifier is designed for use in ventilation devices and ducts. It combines the humidification technologies “atomization” and “evaporation”. Due to its modular design, the Condair Dual covers a wide range of power requirements.

The Condair Dual Hybrid Humidifier incorporates the latest technical advances and meets all recognized safety standards. Nevertheless, improper use may result in danger to the user or third parties and/or impairment of the installation or other material assets.
All persons working with the Condair Dual Hybrid Humidifier must observe and comply with all information and safety instructions contained in the present installation and operating instructions.

The worldwide well-organized distributor network of Axair Ltd. provides service at all times by qualified technicians. Please contact your Condair supplier in case of trouble or if you have any questions concerning humidification technology in general.

1.2 Notes on the installation and operating instructions

Limitation

The present installation and operating instructions contain all information required for correct **installation**, **operation** and **maintenance** of the Condair Dual Hybrid Humidifier. The information is to be observed by the personnel in charge of the respective work.

The installation and operating instructions are supplemented by **documents specific to the particular installation** (installation drawings, technical specifications and so on). Wherever necessary, these publications are appropriately cross-referenced in the present installation and operating instructions.

As a complement to the present installation and operating instructions please observe:

– all local safety regulations regarding the handling of mains-powered electrical devices.

– all instructions and warnings contained in the publications for the products used in conjunction with the Condair Dual Hybrid Humidifier.

– all safety instructions regarding the installation (ventilation facility) into which the Condair Dual Hybrid Humidifier is to be incorporated.

– all instructions and warnings provided on the Condair Dual Hybrid Humidifier.

– all local sanitary regulations.

Conventions

The following conventions apply to the present installation and operating instructions:

– **Steps to be carried out** (operational sequence) are preceded by a "•" bullet.

– This symbol identifies **safety and danger instructions** which, if disregarded, could result in personal injury and/or damage to material assets.

– This symbol identifies additional **information and instructions** designed to assist you in handling your hybrid humidifier and ensure a proper and economical operation.

Safekeeping

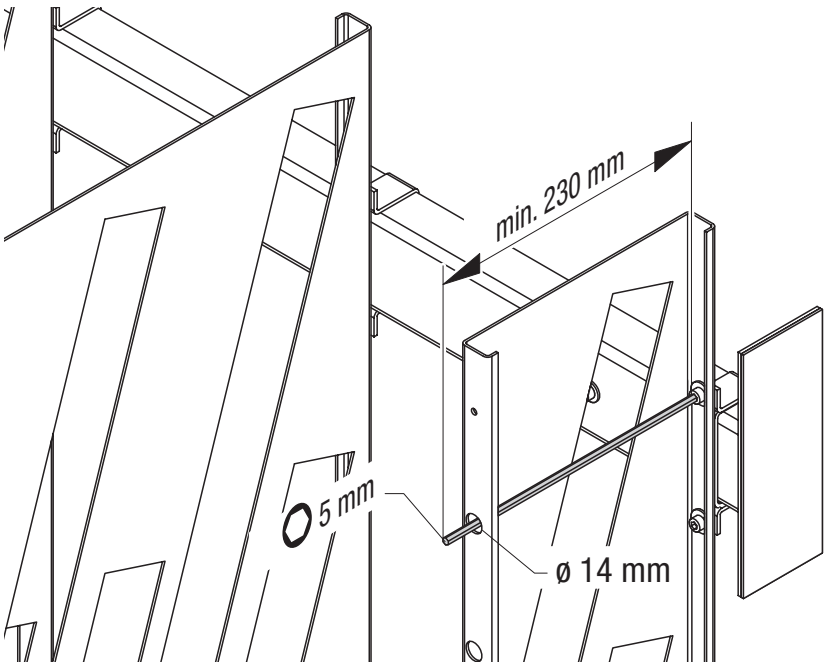
Please keep these installation and operating instructions in a safe place where they are always available. If ownership changes, they must be passed on to the new operator.
If this documentation gets misplaced, please contact your Condair supplier to obtain immediate replacement.

Language versions

The installation and operating instructions for the Condair Dual Hybrid Humidifier are available in several languages. Please contact your Condair supplier if you require another language version of the present documentation.

1.3 Special tools

Important! Fastening the outer left and right vertical sections to the cross arms of the post-evaporation unit requires a 5 mm hexagon socket extension with a length of at least 230 mm (not included in the delivery).



2 Important notes

Please read this chapter carefully. It contains important information, which must be observed for safe, correct and economic application of the Condair Dual Hybrid Humidifier.

2.1 Correct use for intended purpose

The Condair Dual Hybrid Humidifier is intended exclusively for **humidification in ventilation systems**. Any other type of application, without the written consent of Axair Ltd., is considered as not conforming with the intended purpose. **The manufacturer/supplier cannot be made liable for any damages resulting from improper use. The user bears full responsibility**.

Correct use for intended purpose further includes:

- observation of all instructions, regulations, and notes contained in the present installation and operating instructions for the Condair Dual Hybrid Humidifier.
- strict adherence to the specified inspection and maintenance intervals.
- correct maintenance of the hybrid humidifier.
- compliance with specified ambient and operating conditions.

2.2 Safety instructions

- The Condair Dual Hybrid Humidifier must only be installed, operated, and serviced by persons familiar with the product and sufficiently qualified for the respective task. It is the customer's responsibility to ensure that the installation and operating instructions are supplemented by internal instructions with respect to supervisory and notification liability, working methods, personnel qualifications, etc.
- Do not carry out any operations for which you are not sufficiently qualified or unfamiliar with the consequences. In case of doubt, contact your supervisor or Condair supplier beforehand.

- **Before carrying out working steps** on particular components of the Condair Dual Hybrid Humidifier set the ventilation system and the humidifier **out of service**, **disconnect them from the power supply** by setting the service switch to "Off" and **secure the units against unintentional operation**.
- Installation, maintenance, and repair of the electrical installation of the Condair Dual must be carried out only by qualified personnel being aware of possible danger and implications.
- Poorly maintained humidification systems may endanger health. Therefore it is mandatory to **observe the specified maintenance intervals** and to **carry out maintenance work in strict accordance with the instructions**.
- Observe all local safety regulations regarding the handling of mains-powered electric and electronic equipment.

– **Caution! To prevent damage caused by water the Condair Dual must be installed only in rooms provided with a floor drain. If for some reason the Condair Dual must be installed in a location without floor drain, it is mandatory to provide a water tub with drain or water sensors to safely interrupt water supply in case of leakage.**

– For safe operation of the hybrid humidifier, make sure the ambient conditions meet the respective specifications (see chapter 7 “Technical data/ambient conditions”).

– **Caution!** Fully demineralized water is aggressive. For this reason, permeate lines and components located close to the humidification unit must be made of corrosion-proof steel (minimum requirements according to DIN 1.4301) or plastic.

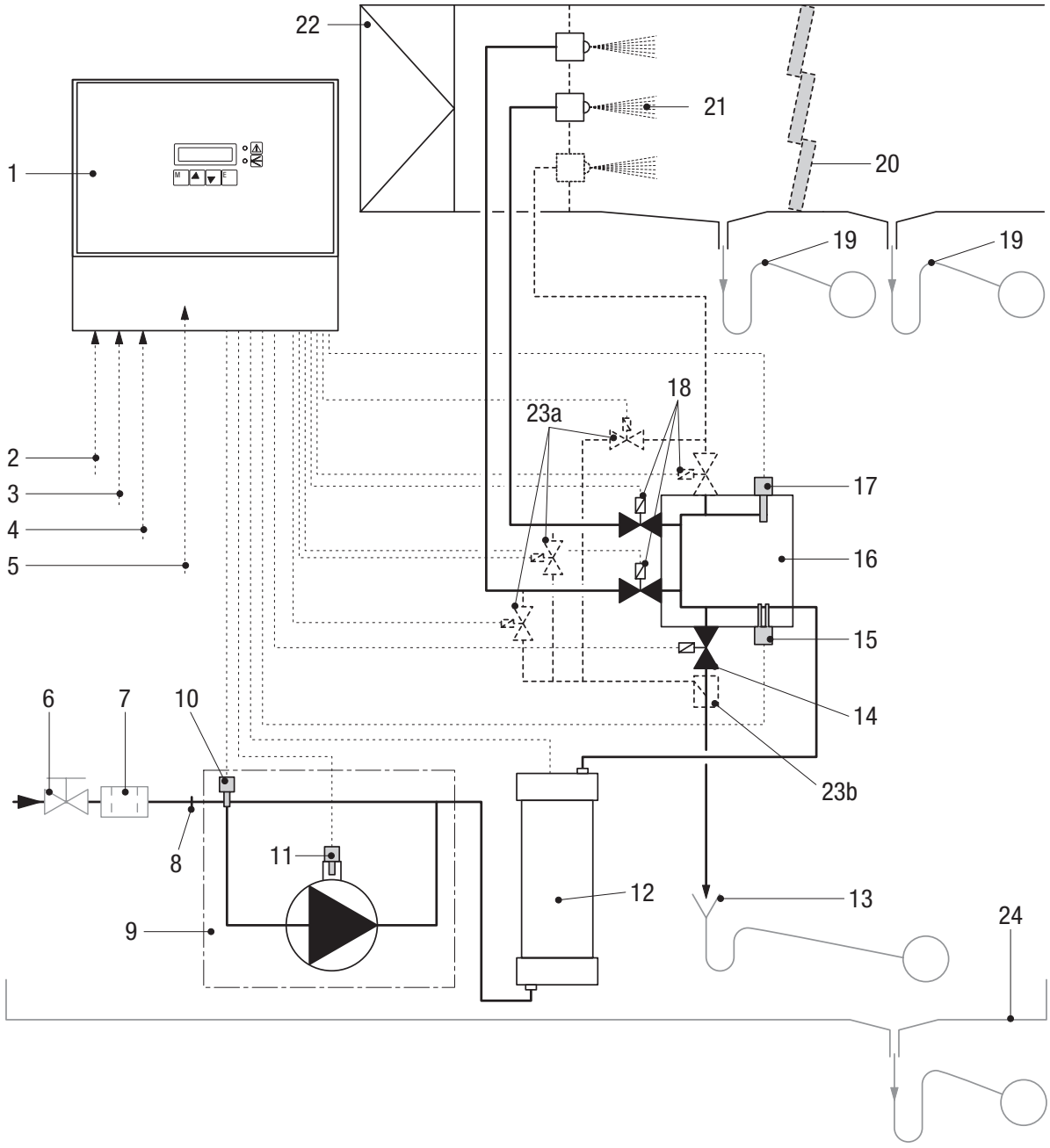
– If it can be assumed that safe operation is no longer possible, the Condair Dual must be taken out of service and secured against unintentional operation. Safe operation may be affected in the following events:
  – components of the Condair Dual are damaged.
  – the Condair Dual does not work correctly.
  – connectors and lines are leaking.
  – components of the Condair Dual are worn or badly soiled.
  – the post-evaporation elements are not correctly positioned, locked or sealed.
  – after longtime storage under unfavorable conditions.
  – after transportation under unfavorable conditions.

– **Use only genuine accessories and spare parts** available from your Condair supplier.

– The Condair Dual Hybrid Humidifier and the optional accessories **must not be modified in any way** without the written consent of Axair Ltd..

3 Overview of the Condair Dual Hybrid Humidifier

3.1 Basic design of the Condair Dual Hybrid Humidifier



1 Control unit
2 Power supply
3 Control or sensor signal input
4 Connector for external safety circuit
5 Options (to be installed inside the control unit):
Remote operating and fault indication (Z401/Z401S)
RS232 serial interface (option Z404)
RS485 serial interface (option Z405)
6 Shut-off valve (by customers)
7 Filter (by customers, max. mesh width 0.125 mm)
8 Connector (G 1/2") for fully demineralized water
9 Booster pump
10 Minimum pressure switch
11 Excess temperature switch of pump
12 Silver ionization unit
13 Drain with siphon trap (by customers)
14 Drain valve
15 Conductance sensor
16 Connector box with 2 spray valves (3-step)
Connector box with 3 spray valves (7-step, option Z407)
17 Maximum pressure switch
18 Spray valves
19 Duct drains with siphon trap (by customers)
20 Post-evaporation elements (porous ceramics)
21 Spray nozzles
22 Air filter min. F6/EU6 (by customers)
23a Drain valves (only with option Z409)
23b Water jet pump (only with option Z409)
24 Water tub or floor drain (by customers)

3.2 Function

From the reversing osmosis system (RO system) the fully demineralized water (also called permeate) is fed to the booster pump (9) via a shut-off valve (7) and a filter (8). Depending on the current output requirements the booster pump increases the water pressure to the required operating pressure of approximately 7 bars (yield load).

From the booster pump the fully demineralized water is fed to the connector box (16), either directly (on systems for exhaust air cooling) or via the silver ionization unit (12) which degerminates the water.

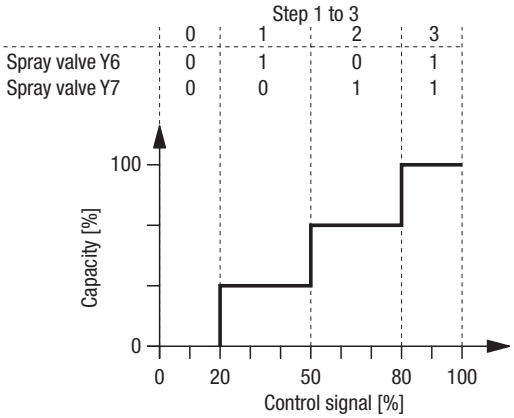
If humidification is required, one or both spray valves (18) of the connector box are opened, depending on the current humidification requirements (if the optional third spray valve is available, the system opens one, two or all three valves at a time).

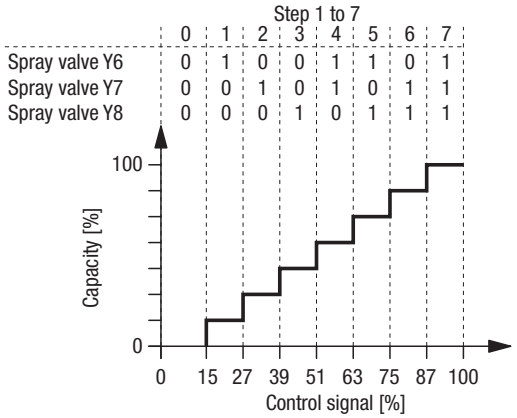
The fully demineralized water is now fed to the respective spray nozzles (21) producing fine aerosol fog. The air passing by the nozzles absorbs the aerosol fog thus getting humidified. Aerosol fog not absorbed by the air is retained in the post-evaporation elements (20) thus humidifying the air passing through the post-evaporation elements. Excess water is flowing down to the bottom of the post-evaporation elements and is led to the siphon trap (19), via the drain in the water tub.

Control

The system is controlled by an external controller or by the PI controller built into the control unit.

The standard system with a 2-valve connector box provides a 3-step control corresponding to 1/3, 2/3 and 3/3 of maximum output. The first valve opens at approximately 20 % and the second one at approximately 50 %. If the humidification requirements reach approximately 80% both valves are open.
Note: systems equipped with the optional third valve provide 7-step control with respective humidification power.

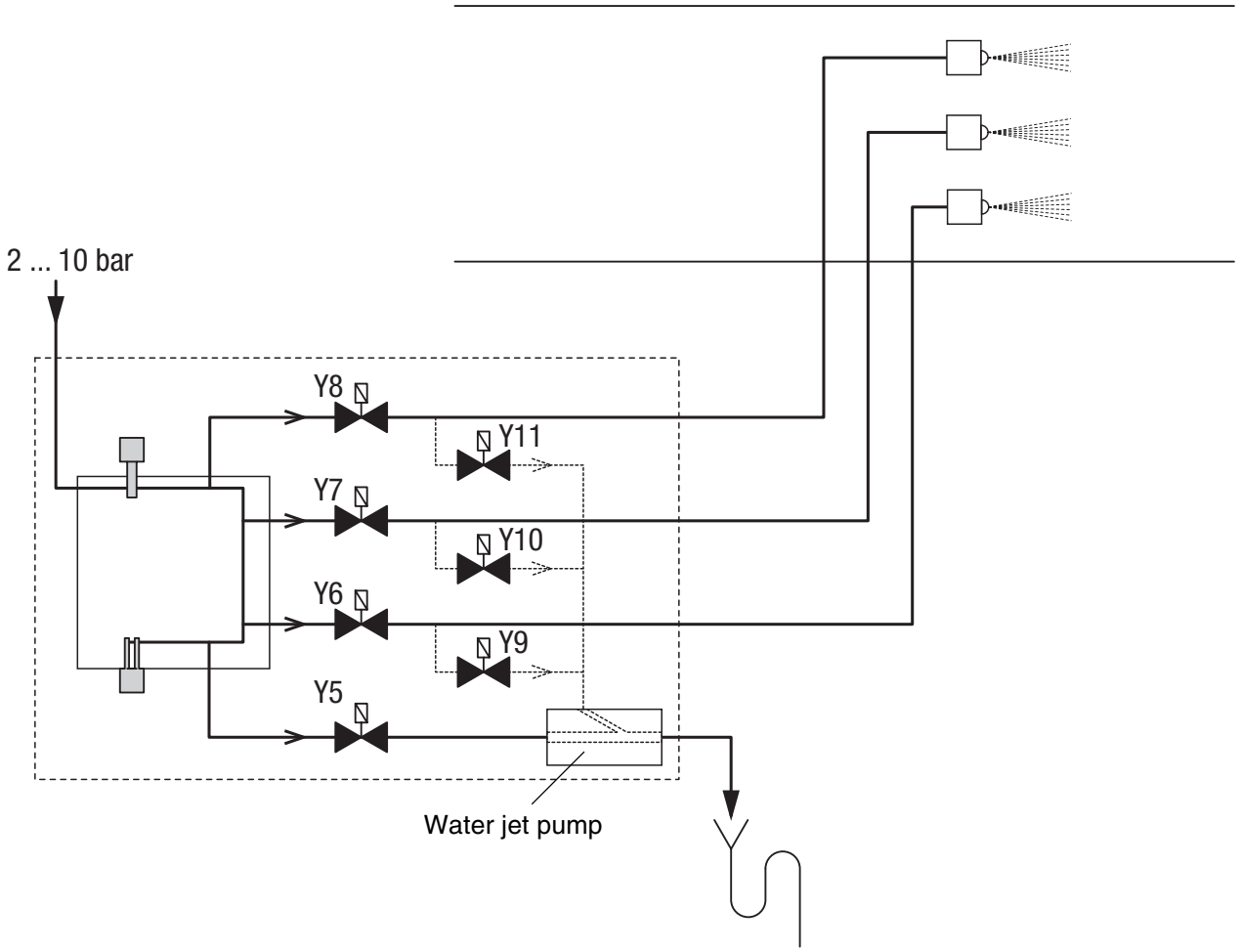



Step 1 to 7
0 1 2 3 4 5 6 7
Spray valve Y6 0 1 0 0 1 1 0 1
Spray valve Y7 0 0 1 0 1 0 1 1
Spray valve Y8 0 0 0 1 0 1 1 1
100
0
Capacity [%]
0 15 27 39 51 63 75 87 100
Control signal [%]

Monitoring

The system continuously monitors the minimum and maximum pressure, the conductance of the fully demineralized water, and the temperature of the booster pump. If the conductance of the fully demineralized water exceeds the admissible range (max. 15 µS/cm), the drain valve (14) of the connector box opens and the water system is flushed until the conductance meets the preset value. An error message is displayed if the conductance value does not reach the admissible range within a certain period.

Spray circle discharge (only with option Z409)



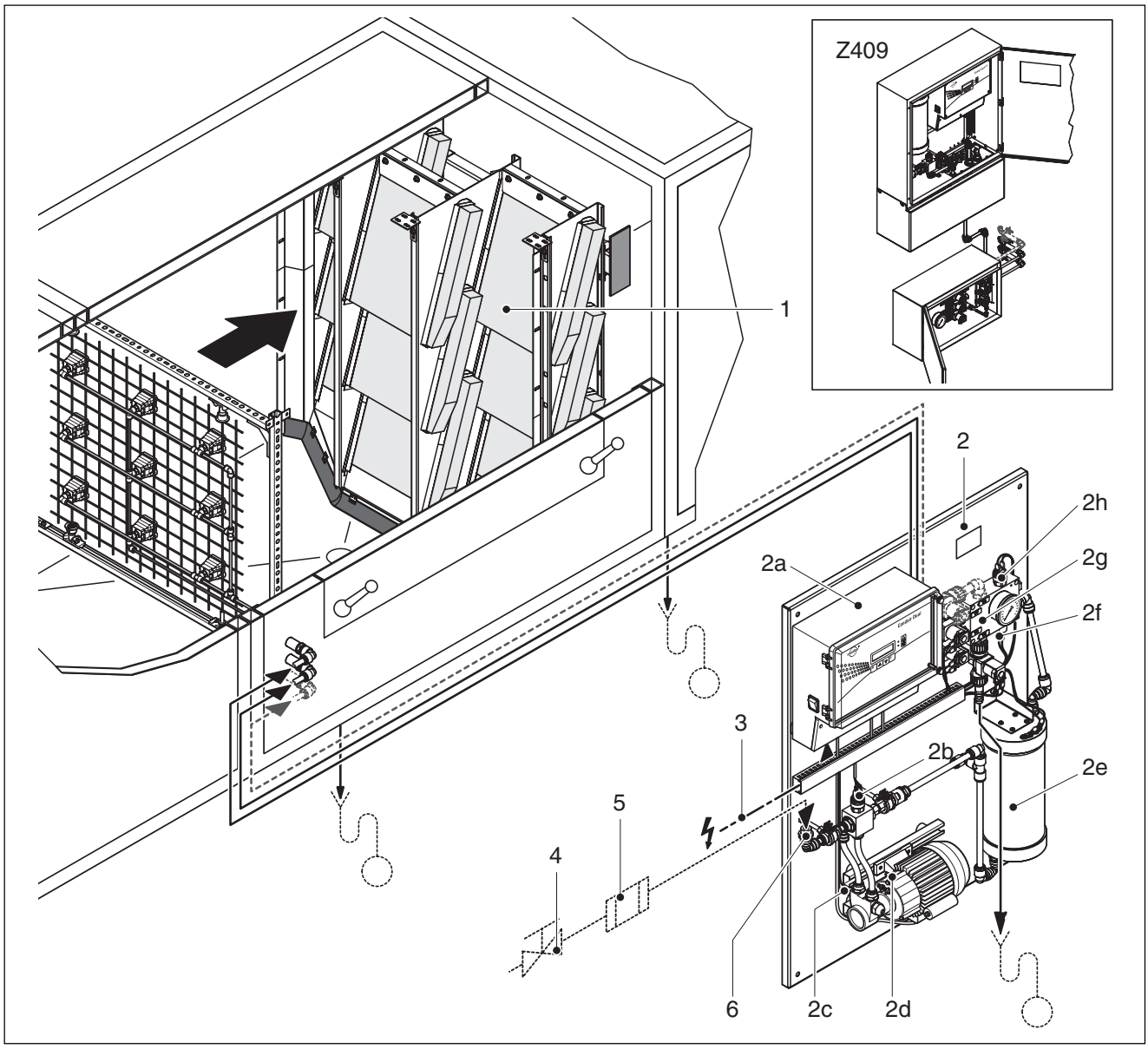
On systems having a central unit with spray circle discharge (option Z409) the spray circle drain valve Y5 opens after no humidification demand has occurred for 12 hours. Then, the valves Y9, Y10 and Y11 open one after the other for approximately 60 seconds to discharge each spray circle via the water jet pump.

3.3 Scope of versions

The Condair Dual Hybrid Humidifier is available in **two versions**: either as "**centralized system**" (type: **CD ZE ...**) or as "**decentralized system**" (type: **CD DZ ...**).

In the centralized system the control unit, the booster pump, the silver ionization unit and the connector box are assembled and wired in the form of a so-called "**central unit**" on a **mounting base** or in a **"Z409 protective cabinet"**. In the decentralized system the above components can be fitted individually (decentralized).

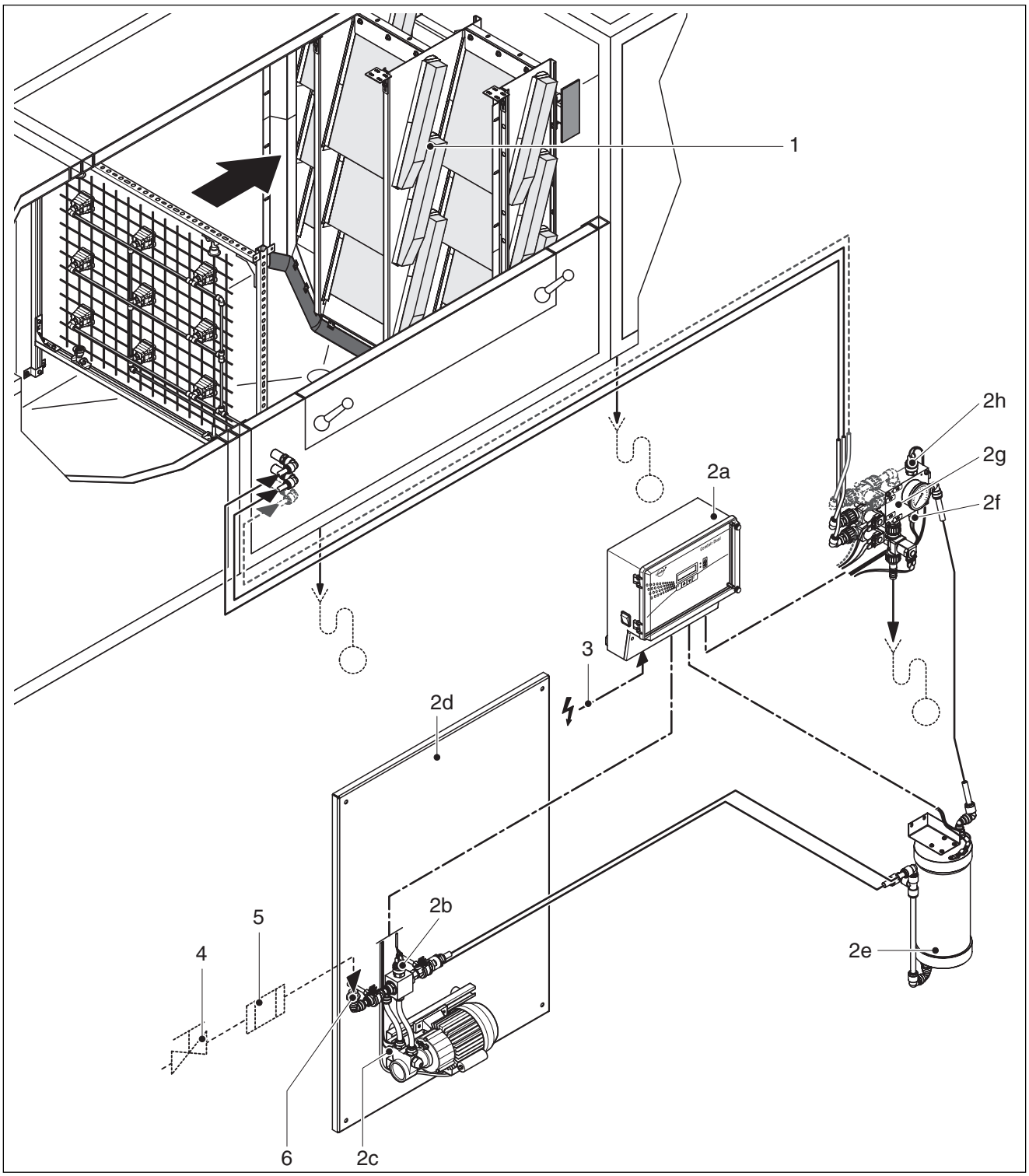
Centralized system (CD ZE ...)



1 Humidification unit
2 Central unit including:
- 2a Control unit
- 2b Permeate minimum pressure switch
- 2c Excess temperature switch of pump
- 2d Booster pump
- 2e Silver ionization unit
- 2f Permeate conductance sensor
- 2g Connector box
- 2h Permeate maximum pressure switch

3 Electrical connectors (power supply, control or sensor signal input, connector for external safety circuit)
4 Shut-off valve (by customers)
5 Filter (by customers, max. mesh width 0.125 mm)
6 Connector (G 1/2") for fully demineralized water

Decentralized system (CD DZ ...)



1 Humidification unit
2a Control unit
2b Permeate minimum pressure switch
2c Excess temperature switch of pump
2d Booster pump
2e Silver ionization unit
2f Permeate conductance sensor
2g Connector box
2h Permeate maximum pressure switch
3 Electrical connectors (power supply, control or sensor signal input, connector for external safety circuit)
4 Shut-off valve (by customers)
5 Filter (by customers, max. mesh width 0.125 mm)
6 Connector (G 1/2") for fully demineralized water

3.4 Options

Remote operating and fault indication "Z401" and "Z401S"

By means of 4 potential-free relay contacts, the remote operating and fault indication PCB (Z401: standard version, Z401S: wire breakage safe version) allows the connection of remote indicators displaying the following stages of operation: "standby", "humidification in progress", "maintenance due" and "error".
Note: The remote operating and fault indication PCB is supplied with separate instructions.

Serial interfaces RS232 "Z404" or RS485 "Z405"

The serial interface (RS232 or RS485) is used to transmit operational data from the Condair Dual Hybrid Humidifier to a PC or a building control system.
Note: It is up to the customer to develop installation-specific software. Information on the communication parameters and the data format supported by the interface is available from your Condair supplier.

Connector box with 3 spray valves "Z407"

The connector box with 3 spray valves allows 7-step control of the Condair Dual Hybrid Humidifier.

Casing for central unit "Z408"

The casing protects the central unit and its components from soiling and damage. The casing may be installed at any time following the installation of the humidifier.
Note: The casing is supplied with separate mounting instructions.

Central unit with spray circle discharge "Z409"

All components of the central unit with spray circle discharge are integrated into two rugged protective cabinets. The large cabinet contains the control unit and the silver ionization. The booster pump is located below the cabinet and covered in front and on both sides by a metal apron. The small cabinet contains the connector box, the spray valves, the drain valve, the spray circle drain valves and the water jet pump. Both protective cabinets are constructed in accordance with industry standards and comply with **protection class IP54**.

External dimensions of **large** cabinet (w x h x d) in cm: 60 x 60 x 21

External dimensions of **small** cabinet (w x h x d) in cm: 50 x 30 x 21

4 Installation and first-time commissioning

4.1 Safety notes for installation and commissioning

- **All installation and commissioning work must be performed only by adequately qualified personnel being familiar with the Condair Dual Hybrid Humidifier**. It is the customer's responsibility to ensure suitable qualification.
- Prior to installation work, the ventilation system (into which the Condair Dual is to be incorporated) must be taken out of operation and secured against unintentional start-up.
- It is mandatory to observe and comply with the **instructions regarding the location and installation of particular components** of the Condair Dual Hybrid Humidifier (see chapters 4.2 through 4.5).
- Use **only the mounting accessories included in the delivery** for installing the various system components. If for some special reasons an installation with the supplied installation accessories is not feasible, choose a type of installation that is equally stable. In cases of doubt, contact your Condair supplier.

4.2 Installation of the humidification unit

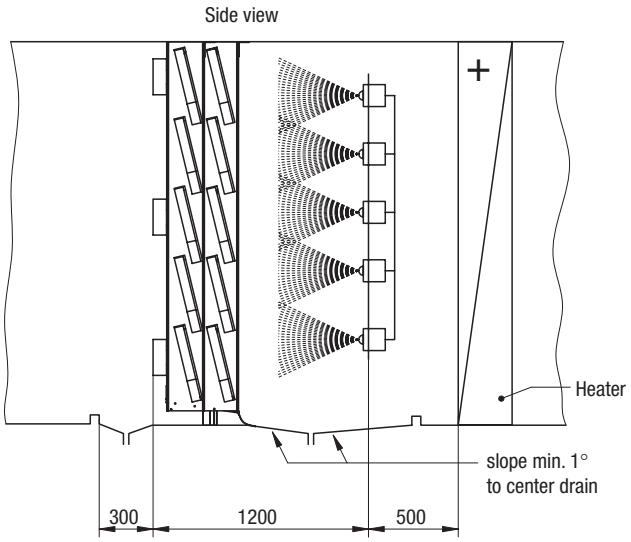
Important notes

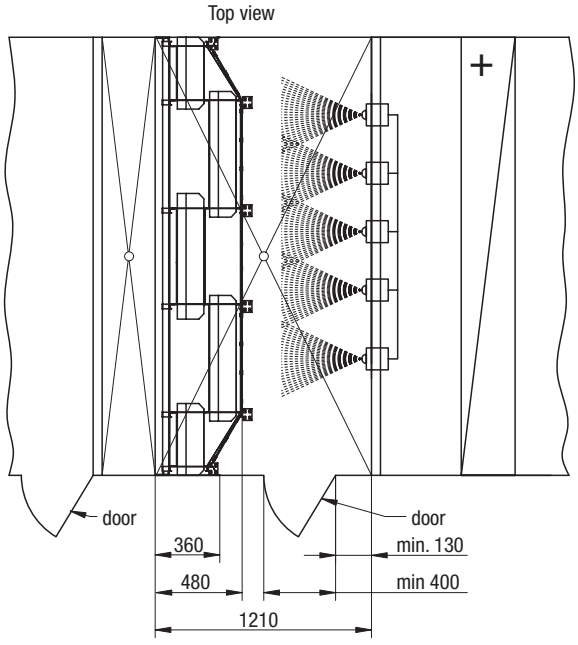
Usually, the design and dimensioning of the ventilation duct/monoblock as well as the location of the Condair Dual Hybrid Humidifier inside the duct are determined, recorded and set compulsory when planning the entire system. Prior to installation, however, make sure the following criteria have been taken into consideration:

- **Caution, fully demineralized water is aggressive!** For this reason, all components located close to the humidification unit (duct/monoblock, fastening material, drain pipe, etc.) must be made of **corrosion-proof steel** (minimum requirements according to DIN 1.4301) or **plastic**.
- For installation and maintenance of the humidification unit a **viewing window** and a sufficiently large **maintenance door** must be available in the duct/monoblock.
- In the area of the humidification unit the ventilation duct/monoblock must be waterproof.
- **Important! An air filter must be installed at the air inlet of the humidification unit. The filter must meet the quality standards F6 (EU6) or better.**
- In case of low ambient temperature the duct must be insulated to prevent the moist air from condensing inside the duct.
- If the system is equipped with a heater, make sure it is at least 0.5 m away from the humidification unit.
- **In order to avoid drops seeping over the ceramic elements, an even air flow over the full cross section of the post-evaporation unit must be guaranteed. If necessary, rectifiers or perforated plates must be installed on the building side before the humidifier.**
  If the air velocity in the duct before the post-evaporation unit (in relation to the humidification efficiency) exceeds 2.5 m/s, booster elements must be installed (see chapter 4.2.2).

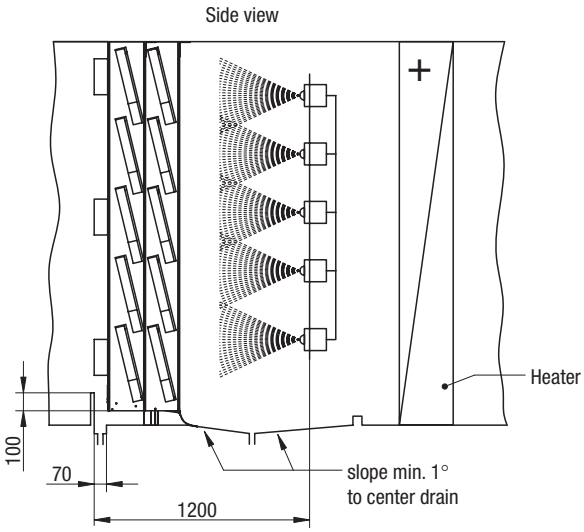
– **The section of the duct holding the humidification unit must be equipped with a sloping tub having drains before and after the post-evaporation unit (pass-through tub), or with a drain before the separation as well as drains before and after the post-evaporation unit (separated tubs). Each drain must be connected separately to the waste water system via a siphon. For hygienic reasons connect the drain pipes with an open outlet to the waste water system of the building.**
Note: The effective height of the siphon drain depends on the duct pressure. Correct dimensioning of the siphon drain is the customer's responsibility.

Version 1 (optimal)





Version 2 (installation length optimized)

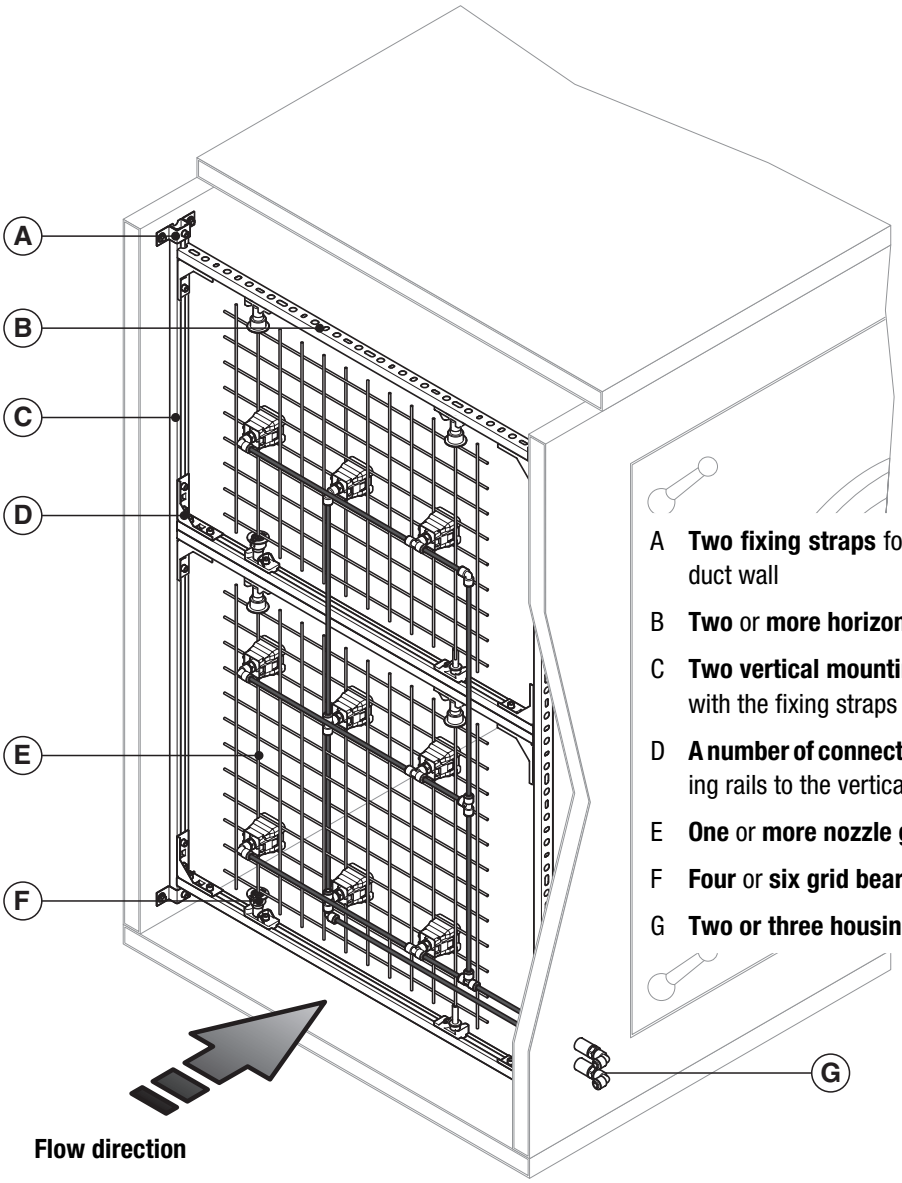


4.2.1 Installation of the nozzle system

The components of the nozzle system are supplied separately and must be assembled at the installation site.

The following sections explain the general installation of the nozzle system. Detailed information (dimensions, fastening points, etc.) can be found in the "**installation drawing**" supplied with your particular system.
Important! The dimensions listed in the installation drawing **are mandatory**.

The **nozzle system** comprises the following main components:



A **Two fixing straps** for fixing the vertical mounting rails to the duct wall

B **Two** or **more horizontal mounting rails**

C **Two vertical mounting rails**, which are fixed to the duct wall with the fixing straps

D **A number of connection plates** for fixing the horizontal mounting rails to the vertical mounting rails

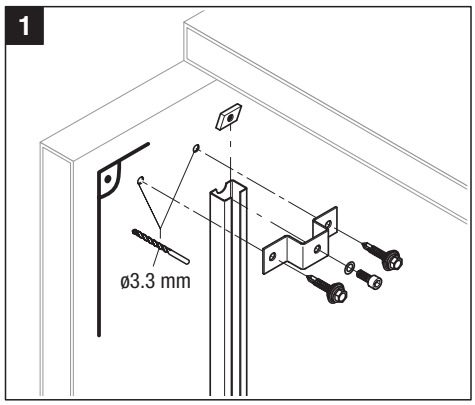
E **One** or **more nozzle grids** with inserted nozzles

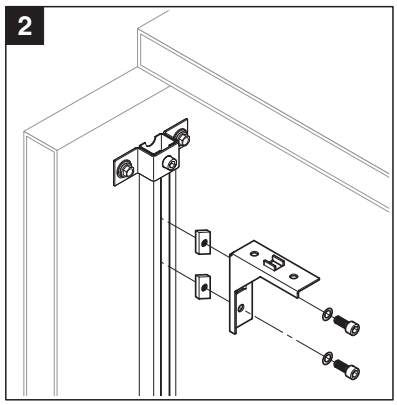
F **Four** or **six grid bearings** per nozzle grid

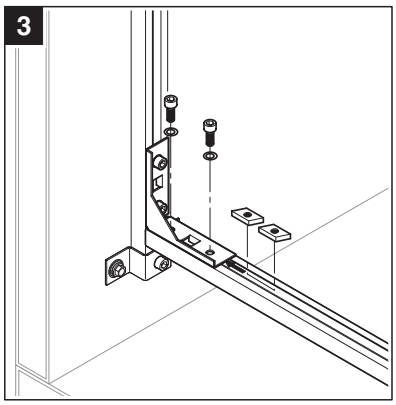
G **Two or three housing entries**

First fix the two vertical mounting rails on both sides in the duct (see installation drawing for positioning and fixing).

Important! Use exclusively the fixing materials provided. If this is not possible in your case, make absolutely sure that the fixing holes **are correctly sealed from the inside of the duct with suitable components.**

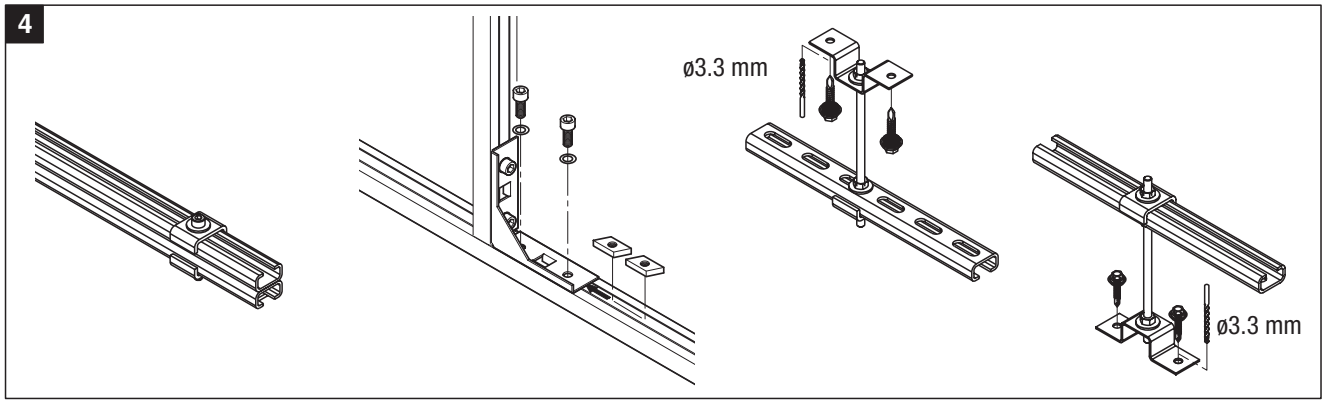




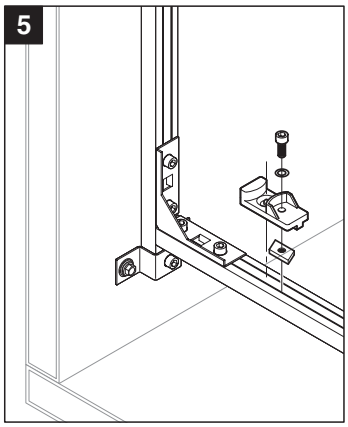


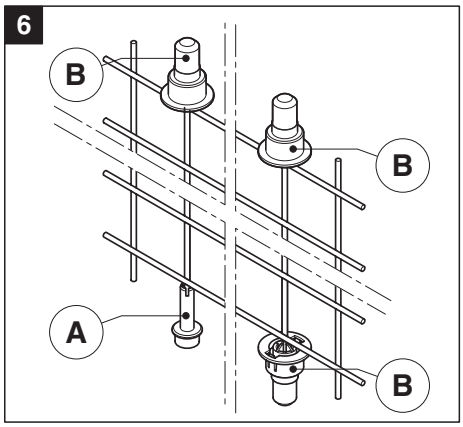
1. Mark the positions of the holes for the fixing straps on the duct wall and drill the ø3.3 mm holes.
   Important! Make sure that the **fixing holes** in the left and right duct wall are **exactly aligned opposite each other** and that the axes of the **upper and lower fixing holes are at right angles to the ceiling of the duct**.

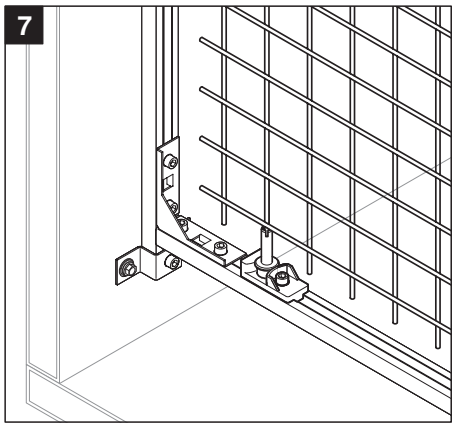
   Then, fix the vertical mounting rails to the wall of the duct with the fixing straps and screws provided.
2. Fix the connector plates to the vertical mounting rails using the screws and sliding nuts provided.
3. Fix the horizontal mounting rails to the connector plates using the screws and sliding nuts provided.



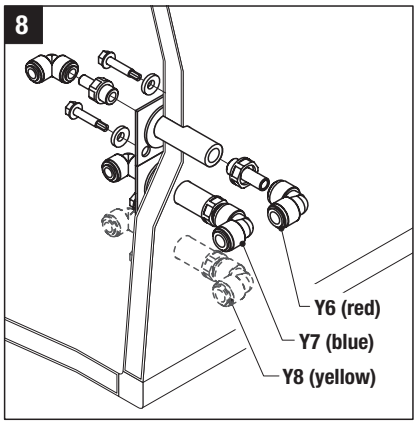
4. **In ducts being wider than 2m**:
   - connect all the adjacently positioned horizontal mounting rails (at the centre, if possible) using the profiled screwed connector/s provided.
   - mount the vertical strut/s between the horizontal mounting rails at the specified position.
   - mount the supplied ceiling attachment and bottom support to the duct ceiling and the duct bottom using the self-tapping screws provided (first drill the ø3.3 mm holes).







5. Fix the grid bearings to the prescribed positions on the horizontal mounting rails, using the screws and sliding nuts provided.
6. Mount bearing sleeve “A” and the three or five bearing bushes “B” on the nozzle grid.
7. Insert the nozzle grid/s in the frames at the appropriate position/s (note numbering on the installation drawing).
   Note: The nozzles are provided with a protective cap Ex-works, so that no dirt can ingress. Remove these caps immediately before commissioning the system.



8. Erect the housing passages (2 or 3, depending on the system) for the spray circuits: Bore the ø19mm holes and install the housing passages in accordance with the adjacent illustration.

   Now connect the spray circuits with the passages in accordance with the installation drawing provided. In so doing, note the following points:

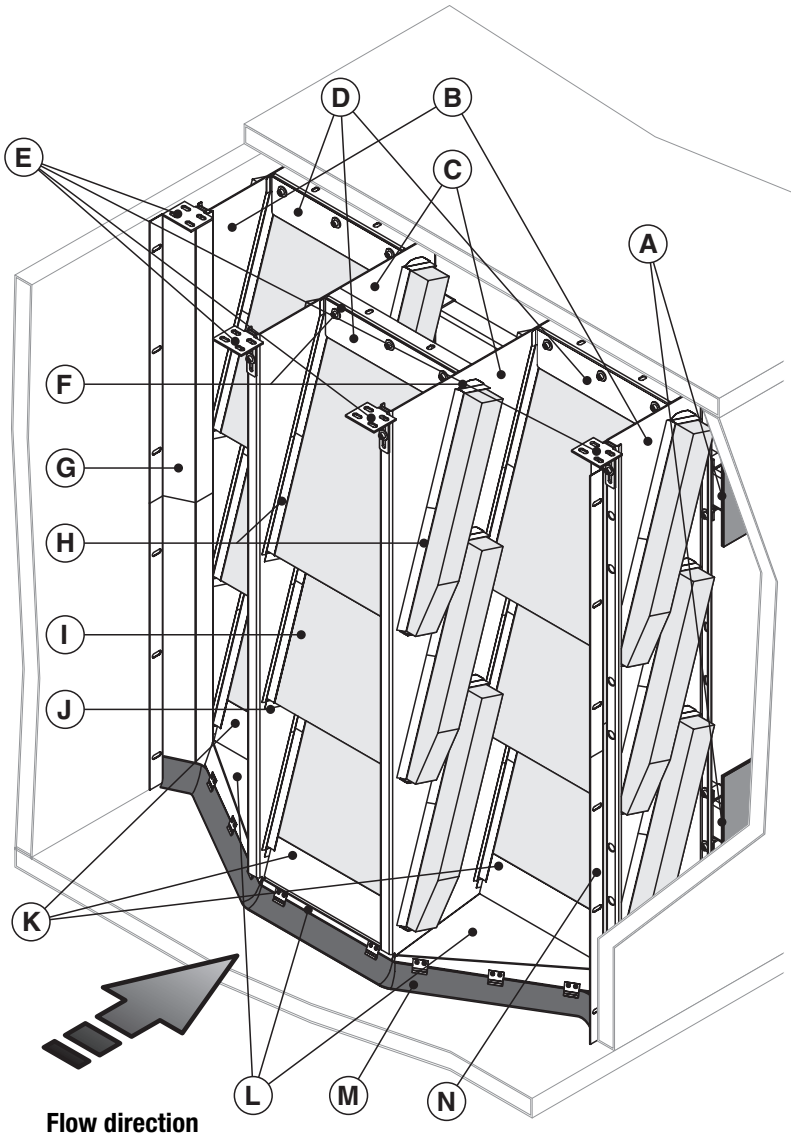
   – The nozzles for the individual spray circuits are identified with colored bushings (red, blue and yellow).
   – **Use only the supplied hoses ø10/8mm** (outside the duct) and **ø8/6mm** (inside the duct). Other hoses may lead to troublesome operation.
   – When cutting hoses always **add at least 5 mm** to the specified length. This way the hoses can be fastened correctly (down to the stop) to the quick-action couplings of the nipples.
     Important! When cutting hoses use an **appropriate tool** providing **straight, kink-free** cuts.
   – Hoses must be free of kinks and other damage (longitudinal scratches, in particular).
   – Verify correct fastening of the hoses. Correctly mounted hoses can not be removed without pressing the locking ring.

4.2.2 Installation of the post-evaporation unit

The components of the post-evaporation unit are supplied separately and must be assembled at the installation site.

The following sections explain the general installation of the post-evaporation unit. Detailed information (dimensions, fastening points, etc.) can be found in the "**installation drawing**" supplied with your particular system. **Important! The dimensions** listed in the installation drawing **are mandatory**.

The **post-evaporation unit** comprises the following main components:



A **One**, **two** or **three** cross arms (depending on the size of the system) each consisting of: 2 wall supports and a U-section, screwed together.

B **One vertical section** on each side of the duct (the openings of the sections facing the duct wall).
Note: The left vertical section is marked with an engraved "**L**" while the right vertical section carries an engraved "**R**".

C **Two** or **more vertical sections "large"**
Note: These vertical sections are marked with an engraved "**M**".

D **Upper flow sheets**

E **Upper angle bracket**

F **Upper plate sealings**

G **Lateral flow sheets left**

H **Lateral plate sealings**

I **Ceramic plates (post-evaporation elements)**

J **Lower plate sealings**

K **Lower flow sheets**

L **Drain-off sheets**

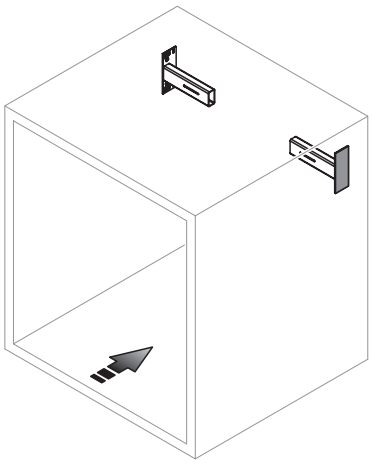
M **Tub sealing**

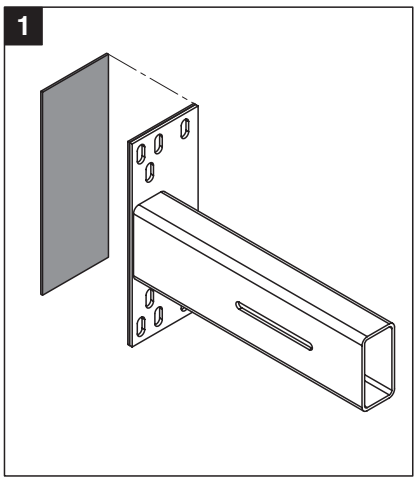
N **Lateral flow sheets right**

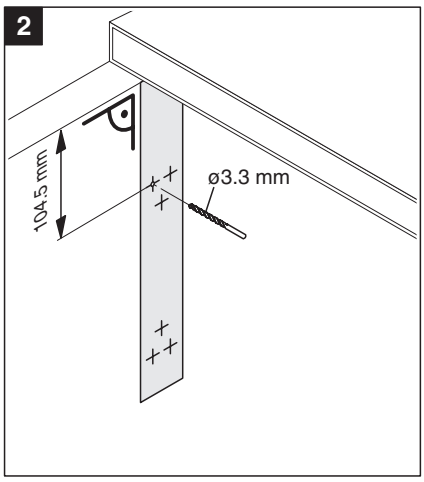
– **Anti-drip sheets** (not visible)

– **Lower angle bracket** (not visible)

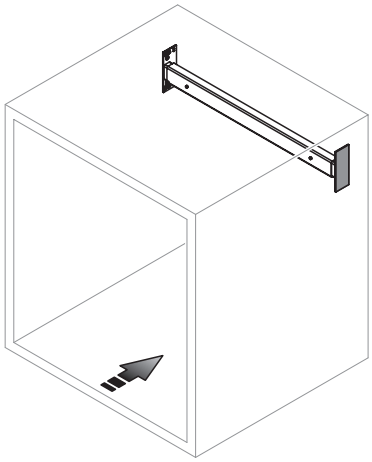
First attach the upper cross arm:

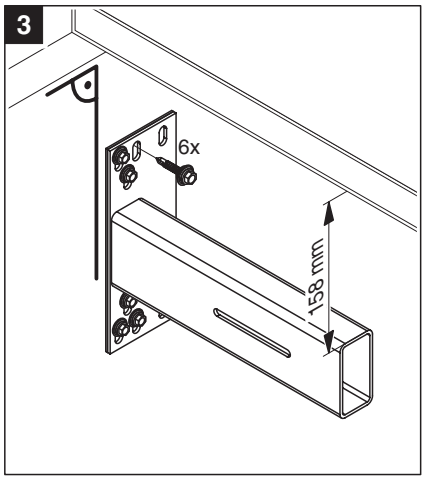


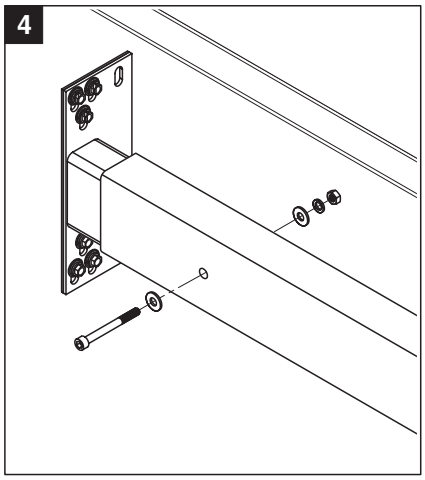




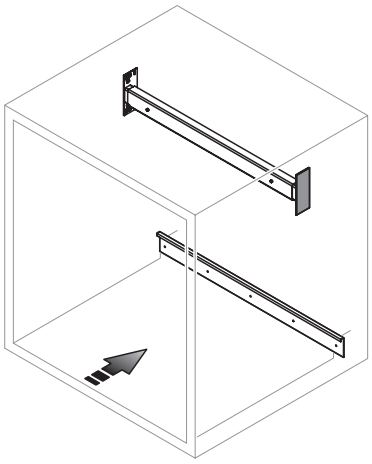
1. Stick the provided self-adhesive sealing plates to all wall supports.
2. Stick the drilling template provided for the left and right wall supports on the wall of the duct at the correct location (see installation drawing) and drill the ø3.3 mm holes (6 holes per wall support).
   Important! Align the drilling templates at right angles to the roof of the duct and at the same distance from the nozzle screen.



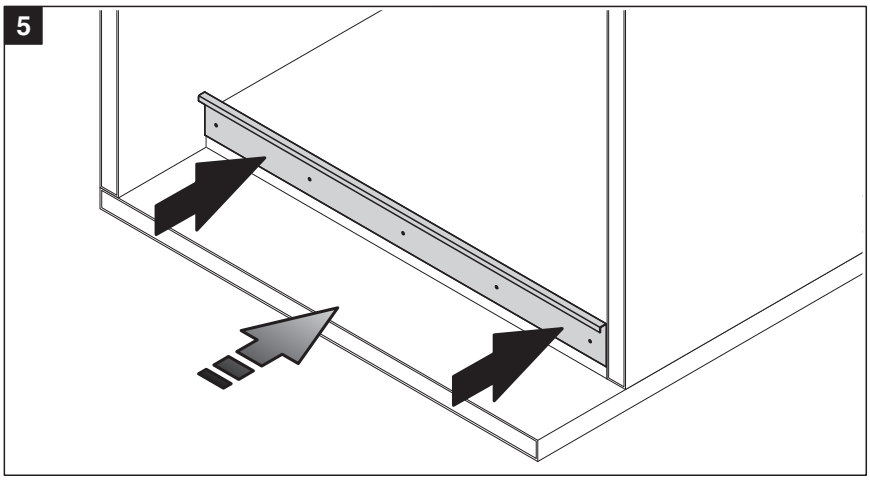




3. Attach both wall supports to the wall of the duct, using the self-tapping screws provided (minimum 6 screws per wall support).
   Important! Before tightening the screws, check that the wall supports are at right angles to the roof of the duct and that the dimension 158 mm between the surface of the support and the duct roof is correct.
4. Fit the U-section member on the wall supports and secure it to the supports with the (M6x55) cylinder head screws, washers and locking rings provided.



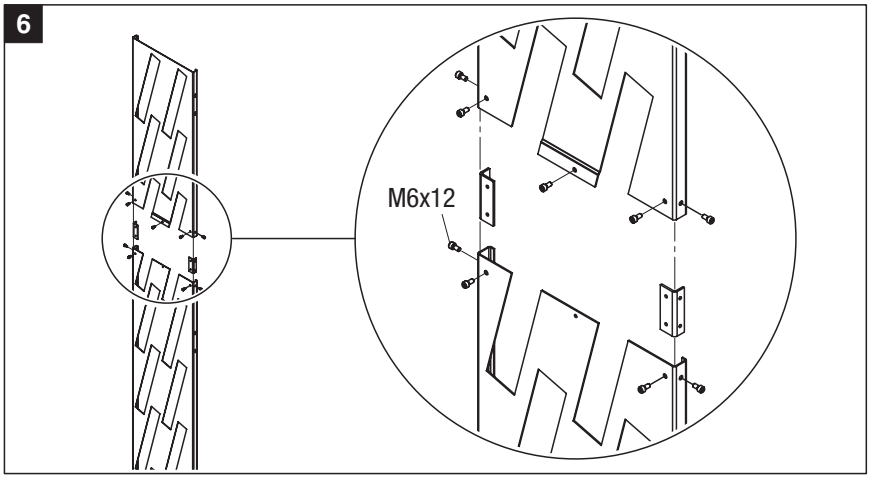
Mount the base plate (only systems equipped with a “Booster”):



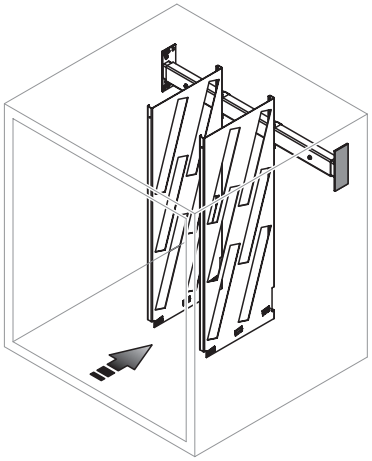
5. If your system is equipped with a “Booster”, now mount the base plate in the tub. The base plate is attached to the tub ledge by pop rivets, behind the post evaporation unit.

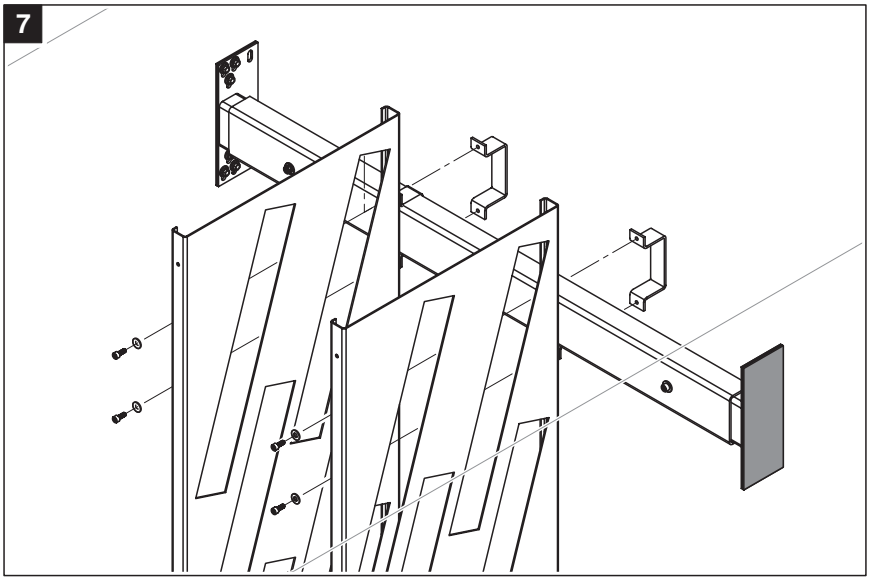
Important! If your system has no service door behind the post-evaporation unit, now place the booster elements in the duct, just behind the base plate.

Connect two-part vertical sections:



6. For systems with two-part vertical sections first connect all sections with the connector pieces “**A**” (2 pcs. per connection) and the M6x12 hexagon socket screws (9 pcs. per connection).

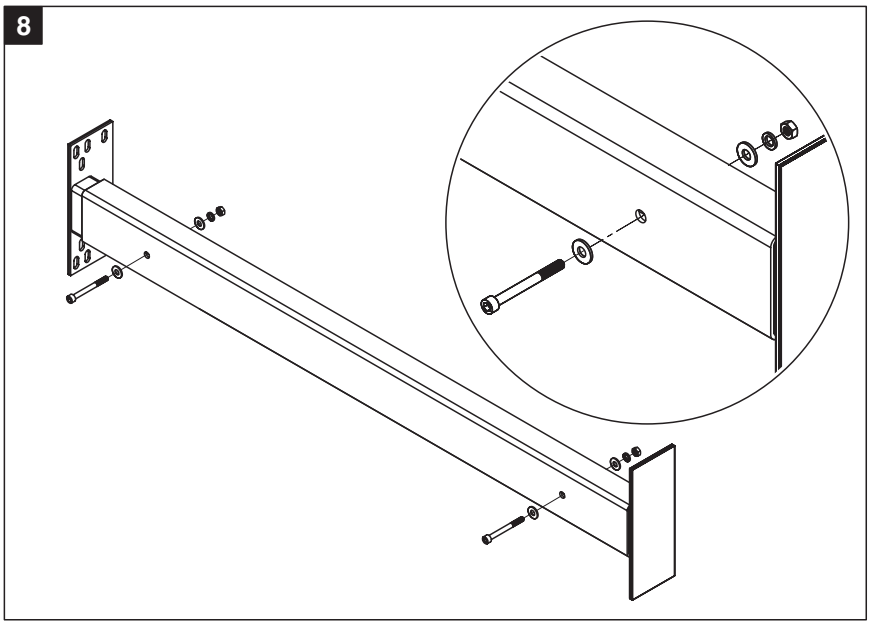




7. Fix each vertical section, left and right, to the upper cross arm, using the clamping brackets, the M6x20 hexagon socket screws and the washers supplied. The two vertical sections serve as spacers when mounting the lower cross arm.

Important! Before tightening the screws, push the vertical sections to the very stop towards the duct roof and **align the supports parallel to the duct wall** and at a **right angle to the duct roof**.

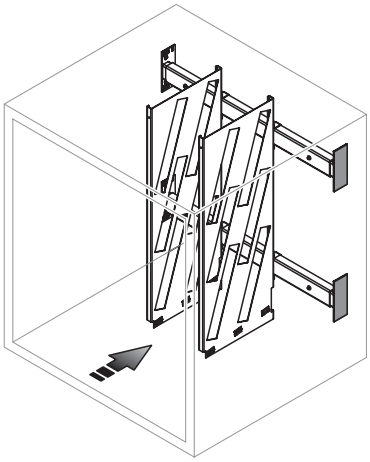
Note: On systems with two-part vertical profiles the shorter section piece is always on top.

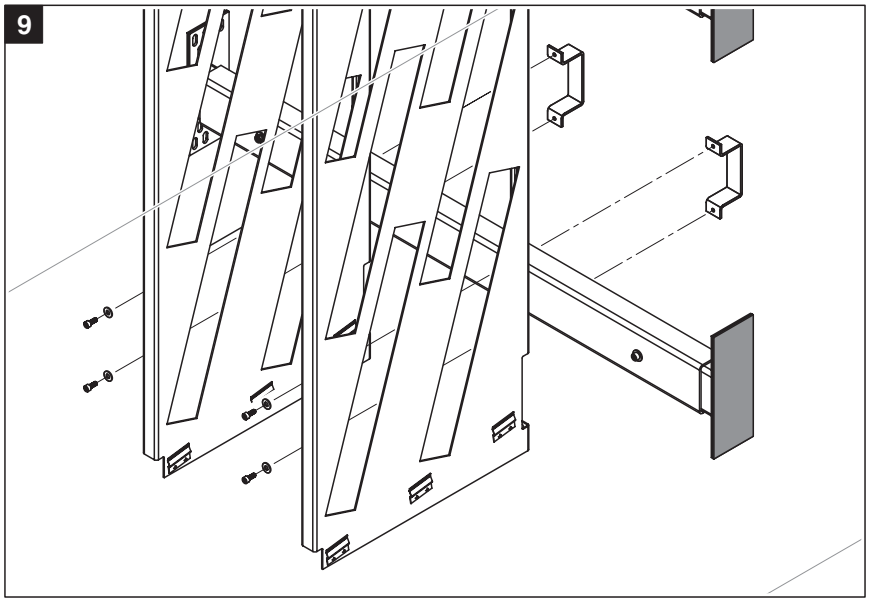


8. If applicable assemble the lower and middle cross arms.

Important! Tighten the screws only to a point at which the wall supports can still be moved in the U-section.

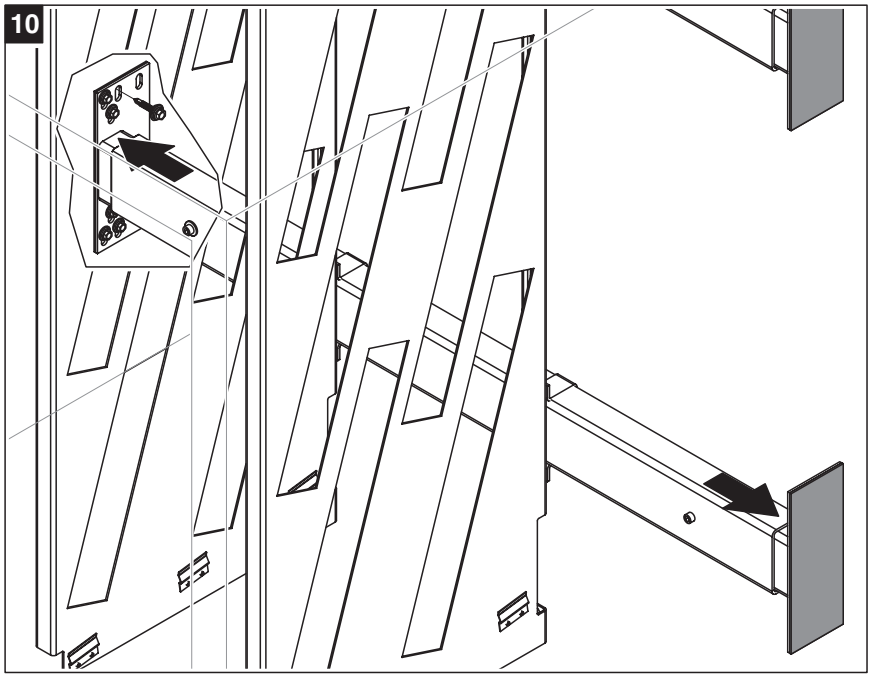
Note: If your system has only one cross arm proceed with step 11.





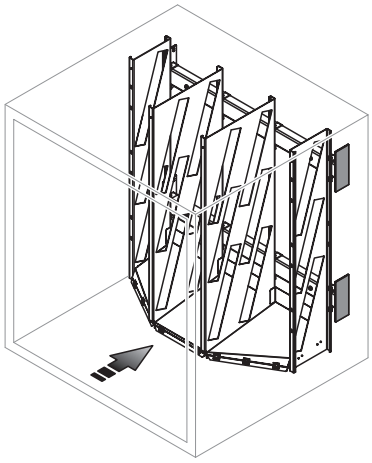
9. Fix the lower cross arm (lowest arm on systems with three cross arms) to the two vertical sections using the clamping brackets, the M6x20 hexagon socket screws and the washers supplied.

Important! Before tightening the screws, align the **two vertical sections parallel to the duct wall** and the **lower cross arm parallel to the upper cross arm**. Make sure the lower cross arm is located precisely vertically below the upper cross arm.



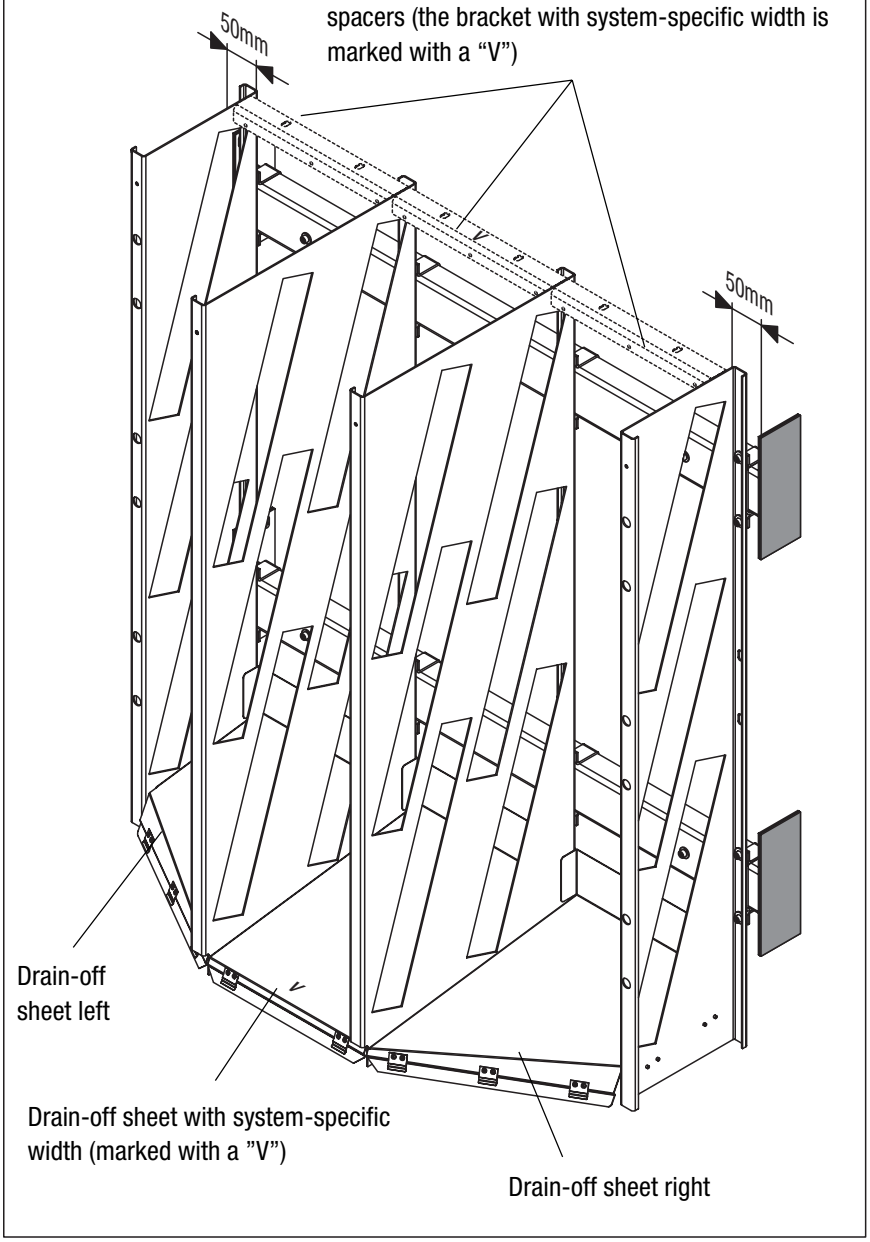
10. Now slide the wall supports of the lower cross arm to the duct wall, **check the alignment of the supporting construction once again**, mark and drill the ø3.3 mm fixing holes (6 holes per wall support). Fix the wall supports to the duct wall using the self-tapping screws provided (minimum 6 screws per wall support).

Note: If your system has three cross arms repeat steps 9 and 10 for mounting the middle cross arm.



Mounting and alignment of the vertical sections:

11


Use the brackets for the upper flow sheets as spacers (the bracket with system-specific width is marked with a “V”)
50mm
50mm
V
Drain-off sheet left
Drain-off sheet with system-specific width (marked with a ”V”)
Drain-off sheet right

11. Use the clamping brackets to fix all vertical sections to the cross arms and temporarily align them according to the installation drawing provided.

Note: Tighten the clamping brackets only to a point at which the vertical sections can still be moved.
Important! The openings of the sections to the very left and right must face the duct wall.

Push the vertical section to the very left towards the duct roof until it comes to a stop, then align it at a distance of 50 mm parallel to the duct wall. Finally, fasten the screws of the respective clamping brackets.

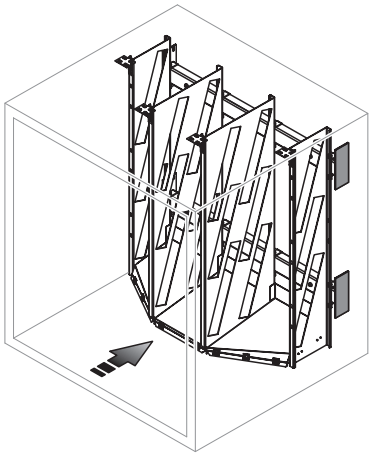
Hang all drain off sheets into the vertical sections and push them down to the very stop.

Important! The drain-off sheet with system-specific width (marked with a “**V**”) must be mounted in the corresponding interstice (see installation drawing provided).

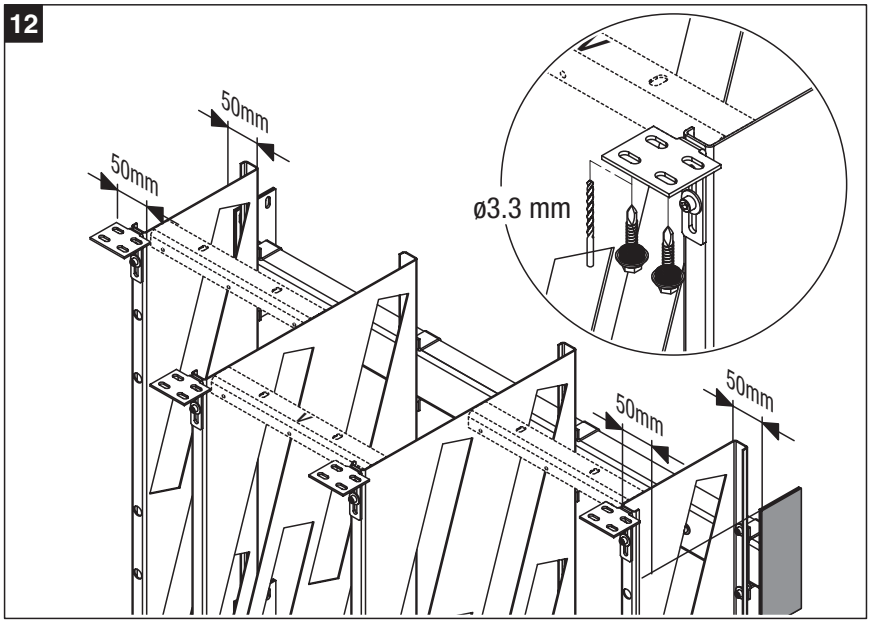
Starting from the (already fixed) vertical section to the very left, align and fix the remaining vertical sections one after the other. Proceed as follows: push the corresponding vertical section towards the duct roof until it comes to a stop. Then, align the section parallel to the preceding section on the left by means of a bracket for the upper flow sheets. Finally, fix the screws of the respective clamping brackets.

Important! At the interstice with system-specific width the bracket for the upper flow sheet marked with a "**V**" must be used as spacer.

Important! The brackets for the upper flow sheets serve as spacers only and **must not be mounted yet**.



12



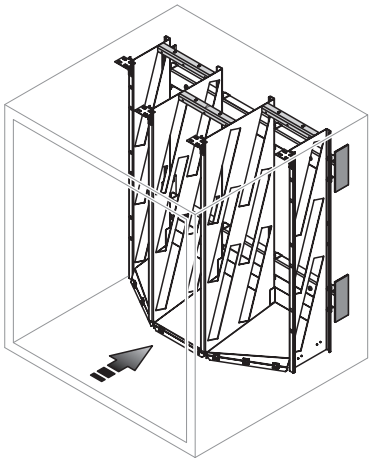
12. Mount the angle brackets to the upper end of all vertical sections and fix them with the M6x12 hexagon socket screws provided (slightly tighten by hand only).

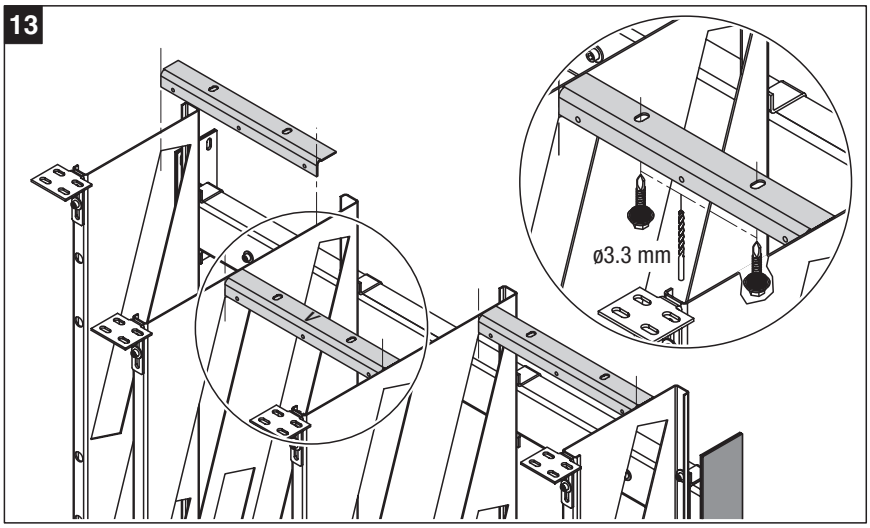
    Align the vertical section to the very left at right angle to the cross arm. Then, push the angle bracket towards the duct roof and fix it to the duct roof using two self-tapping screws provided (drill holes ø3.3 mm before).

    Starting from the vertical section to the very left, align all other vertical sections one after the other and fix them with the angle brackets to the duct roof. Proceed as follows: align the corresponding section parallel to the preceding section on the left by means of a bracket for the upper flow sheets. Then, push the angle bracket to the duct roof and fix it using two self-tapping screws provided (drill holes ø3.3 mm before). Finally fasten the M6x12 hexagon socket screw in the vertical section.

    Important! At the interstice with system-specific width the bracket for the upper flow sheet marked with a "**V**" must be used as a spacer.

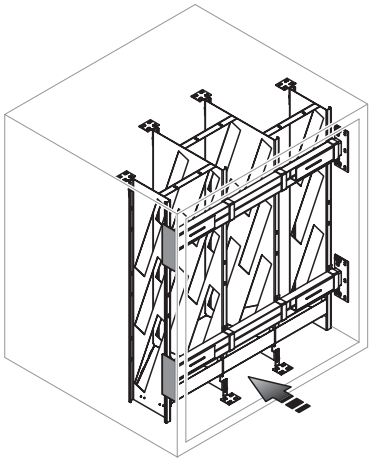
    Important! The brackets for the upper flow sheets serve as spacers only and **must not be mounted yet** (their final installation is explained in the following section).

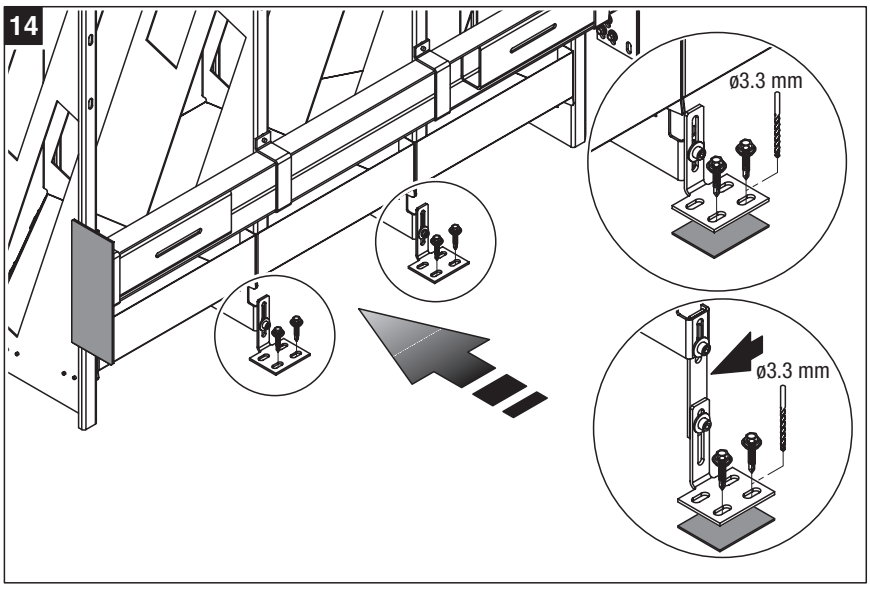




13. Mounting the brackets for the upper flow sheets:
Starting with the narrow vertical section (left or right), align the front edge of the first bracket with the front edge of the topmost opening in the vertical section (see figure above), then fix the bracket to the duct roof using 2 (or 3, as required) self-tapping screws (drill holes ø3.3 mm before). Mount the remaining brackets in an offset order (front/rear, see figure above).

Important! Mount the bracket marked with a "**V**" between the vertical sections with system-specific width.





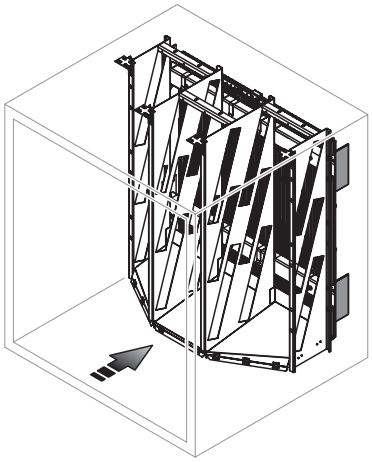
14. Fix self-adhesive sealing plates to the two remaining angle brackets (see illustration above). Use the M6x12 hexagon socket screws provided to fix the angle brackets to the lower end of the two middle vertical sections. Push angle brackets down to the duct floor, then fasten M6x12 hexagon socket screws. Now fix the angle brackets to the duct floor using two self-tapping screws provided (drill holes ø3.3 mm before).

Important! Depending on the slope of the tub the angle brackets may need to be fixed to the vertical sections using the extensions provided (see enlarged section in the figure above).

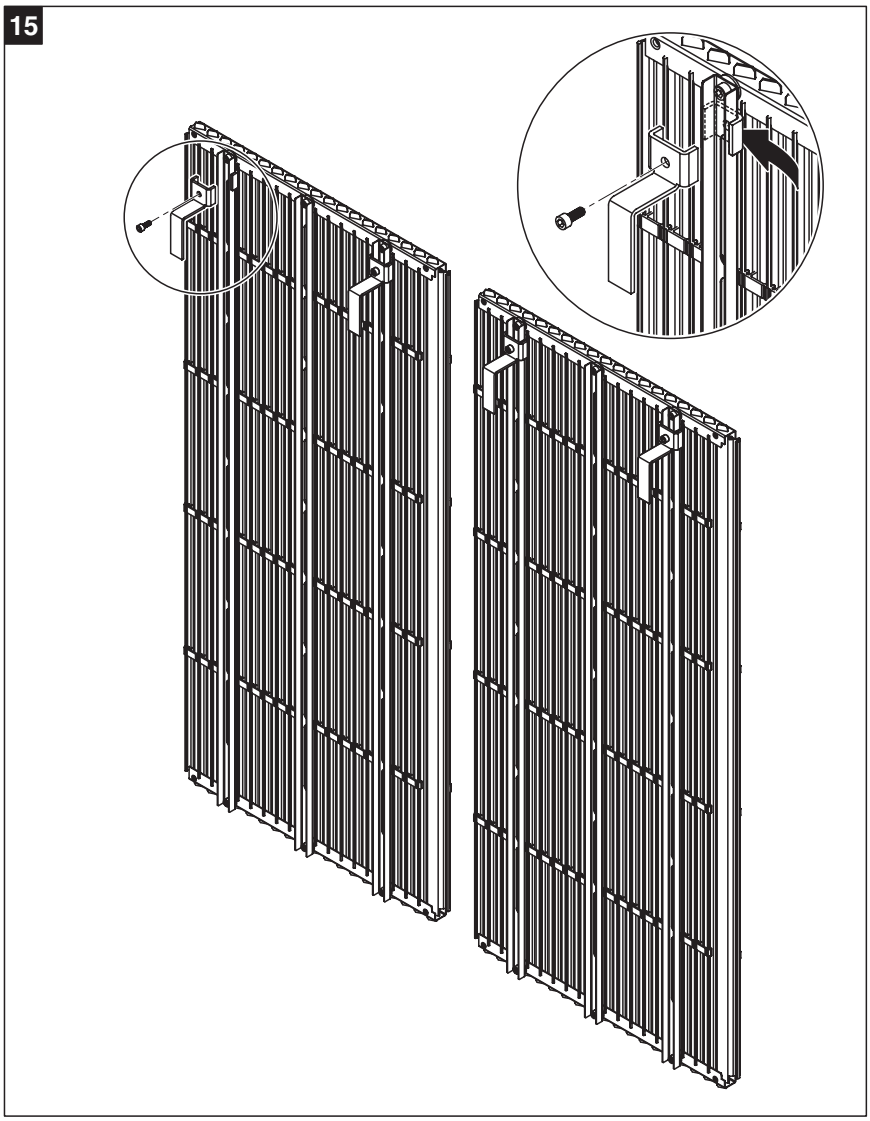
Install the booster elements (only on systems with “Booster”)

If your system is equipped with a “Booster”, the booster elements must now be mounted.

Note: If the post-evaporation unit is accessible from the back via a service door the “Booster” may be installed at the end of the installation procedure. The connector pieces and the short snap lashes are then mounted from the back. Mounting the booster at the end facilitates the installation of the ceramic plates and the ceramic angles.

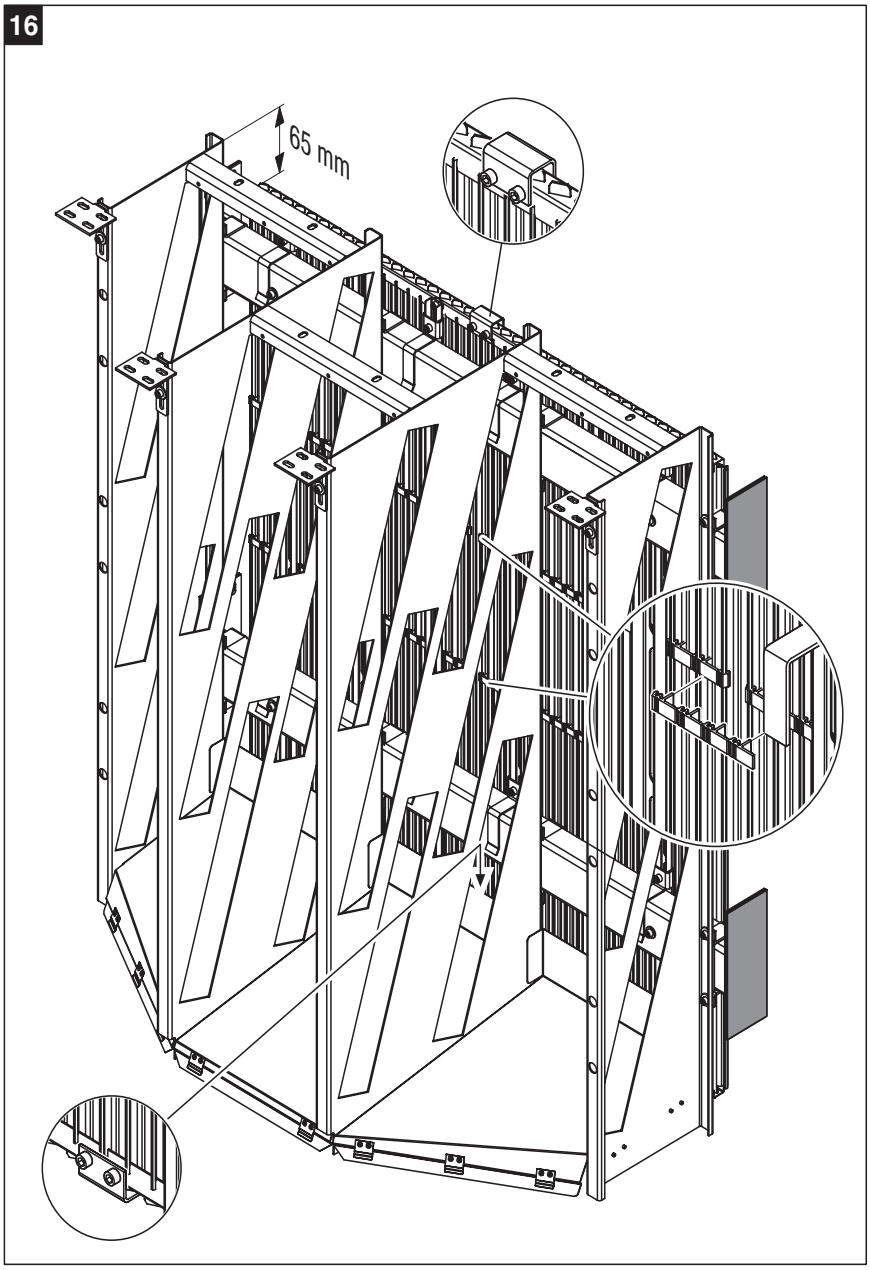


15



15. First fix the two upper brackets to all booster elements using the thread plates and the M6x12 mm hexagon socket screws (use topmost oblong holes).

Important! Tighten the screws by hand only to a point at which the brackets can still be moved.



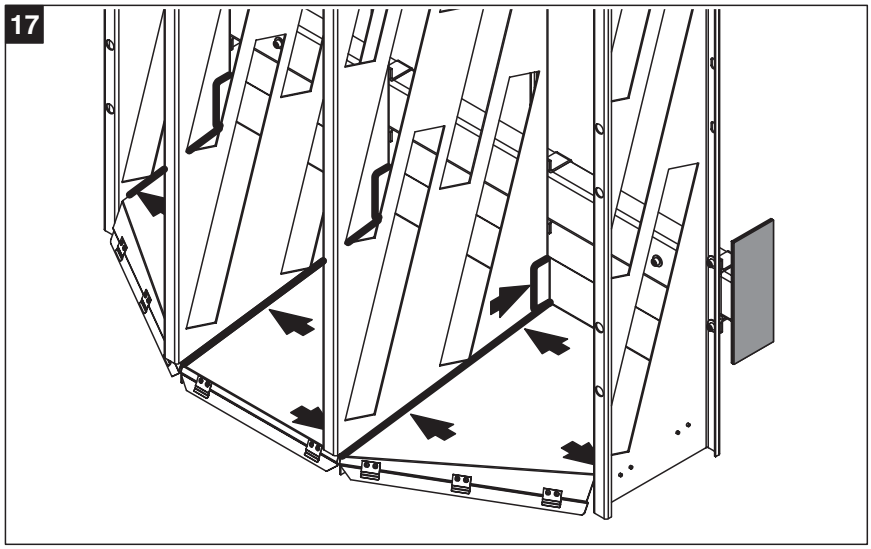
16. From the back, hang all booster elements to the upper cross arm. Use the thread plates and the M6x12 mm hexagon socket screws to fix the remaining brackets (2 or 4) to the booster elements (tighten the screws by hand only to allow later adjustment of the brackets).

    Couple all booster elements at the top and bottom with a connector piece and two hexagon socket screws M6x12 mm as well as with the short snap lashes (attach right below the long snap lashes).

    Important! When mounting the lower connector piece(s) the respective drain-off sheet(s) must be removed again.

    Align the “Booster” centrally, at equal distance to the left and the right duct walls.

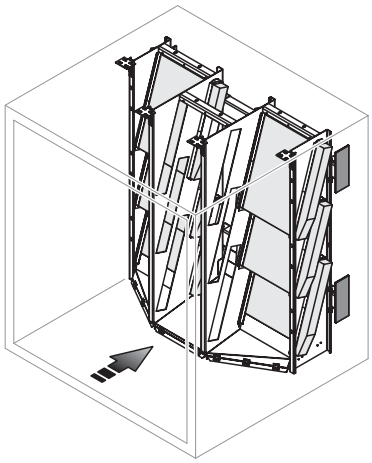
    Finally push the booster elements up to a distance of 65 mm below the duct roof, then tighten the screws of the brackets.

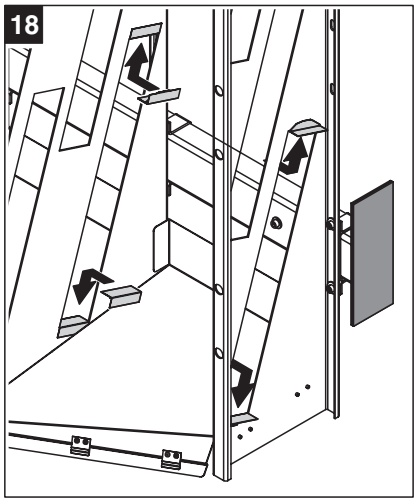


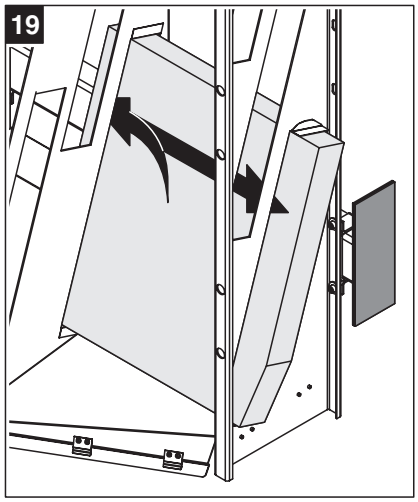
17. Seal all junctions between the vertical sections and the drain-off sheets with sealing compound.

Install the ceramic plates

Note: The installation of the ceramic plates takes place from the bottom to the top and always starts with the two rear rows to the very left and right (viewed in flow direction). Then all other rear rows (if present) are installed and finally all front rows are mounted.





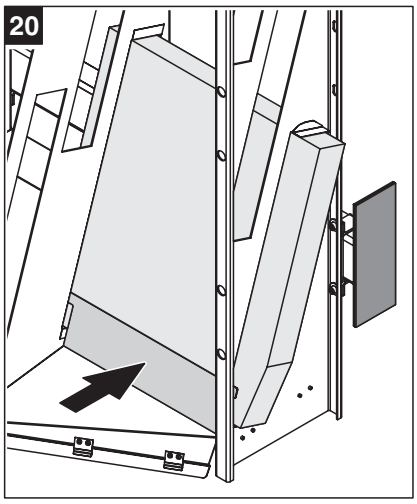


18. Insert the upper and lower plate sealings into the corresponding slots of the vertical sections and push them to the top or to the bottom respectively until they come to a stop (this fixes the plate sealings in position).

    Important! The contact surfaces of the sealing plates must face the protruding end of the ceramic plate mounted later.

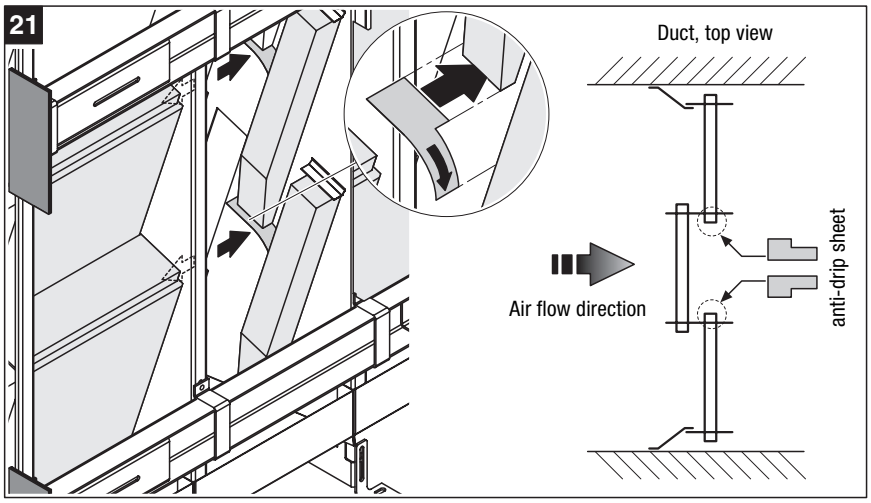
    Important! No lower plate sealing must be installed at the rear ceramic plates that require the installation of an anti-drip sheet (see step 21).

19. Carefully push the ceramic plate (chamfered part facing the bottom) into the corresponding slot of one of the vertical sections, then tilt the plate to the back and insert it into the slot of the other vertical section. Align the ceramic element so that it protrudes for the same amount on each side.



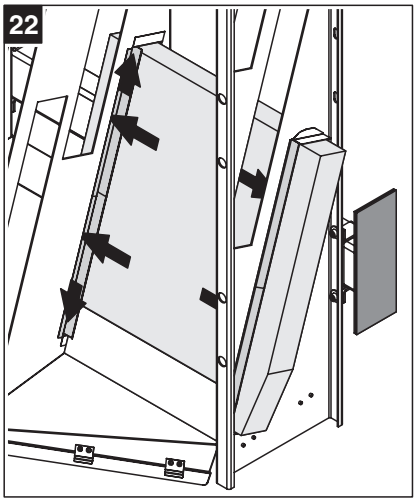
20. Insert in the lower flow sheet between the ceramic plate and the two vertical sections (**this step must be carried out only for the lowest ceramic element of a vertical row**).

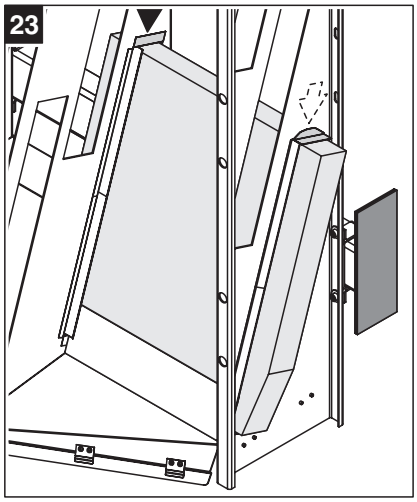
Important! Between the vertical sections with system-specific distance the specially marked lower flow sheet must be mounted.



21. **Only the rear rows of ceramic plates require the installation of anti-drip sheets. However, the anti-drip sheets must be installed only on the sides of the ceramic plates which overlap with the plates of a front row (see figure above). The ceramic plates at the very bottom require the installation of plate sealings instead of anti-drip sheets.**

Insert the anti-drip sheet on the corresponding side between the vertical section and the overlapping ceramic plate until it comes to a stop. Then, bend the free end of the anti-drip sheet downwards so that it forms a curve and touches the lower ceramic plate.



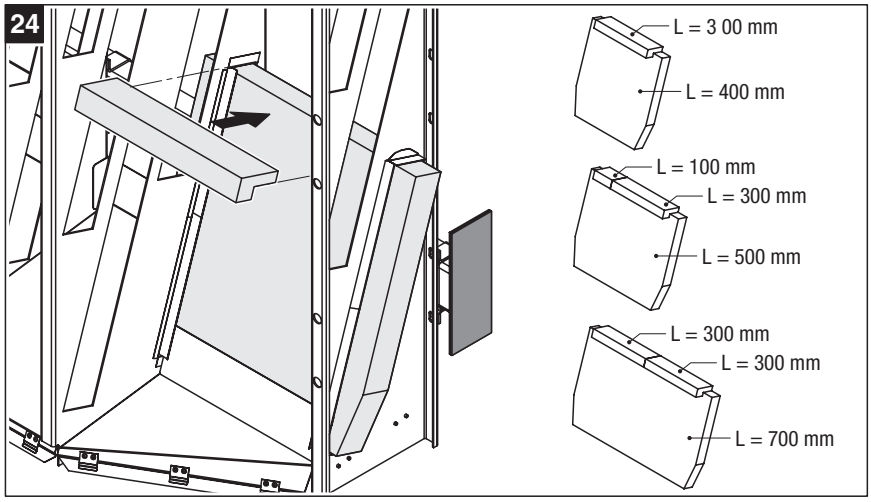


22. On each side insert the two-part lateral plate sealings. Proceed as follows: first insert the lower sealing piece between the vertical section and the ceramic plate, then push it downwards until it comes to a stop. Now insert the upper sealing piece and align its top end with the upper edge of the ceramic plate.

Caution: risk of injury! To prevent injury resulting from the rough ceramic plates or the lateral plate sealings use a spattle (or a similar tool) to insert the plate sealings.

23. Finally, push the two upper plate sealings down until they come to a stop.

Install the ceramic angle

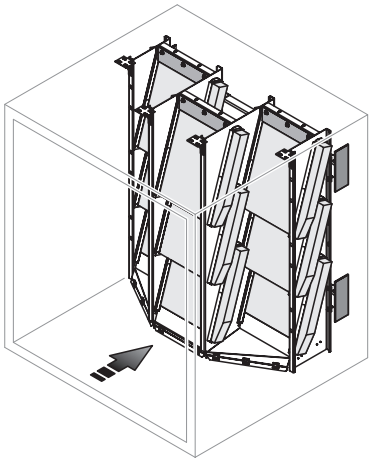


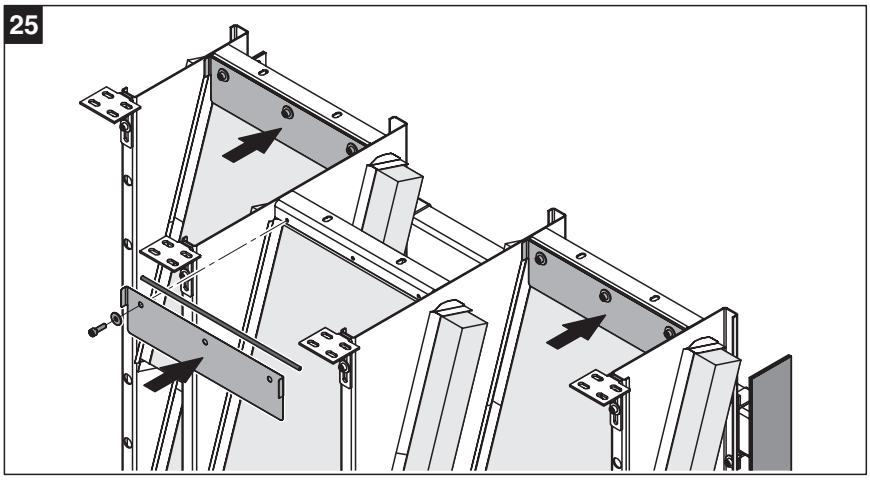
24. Place the ceramic angle (one or two angles) on top of the ceramic plate.

Important! The topmost ceramic plate does not require a ceramic angle.
Important! Between the vertical sections with system-specific interstice the specially marked ceramic angle must be used. On systems with two ceramic angles per plate at least one angle is system-specific.

Repeat steps 17 to 24 until all ceramic plates are installed. Please observe the installation sequence of the plate rows.

Install the upper flow sheets:

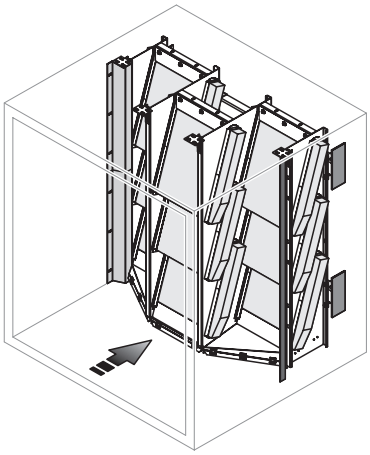


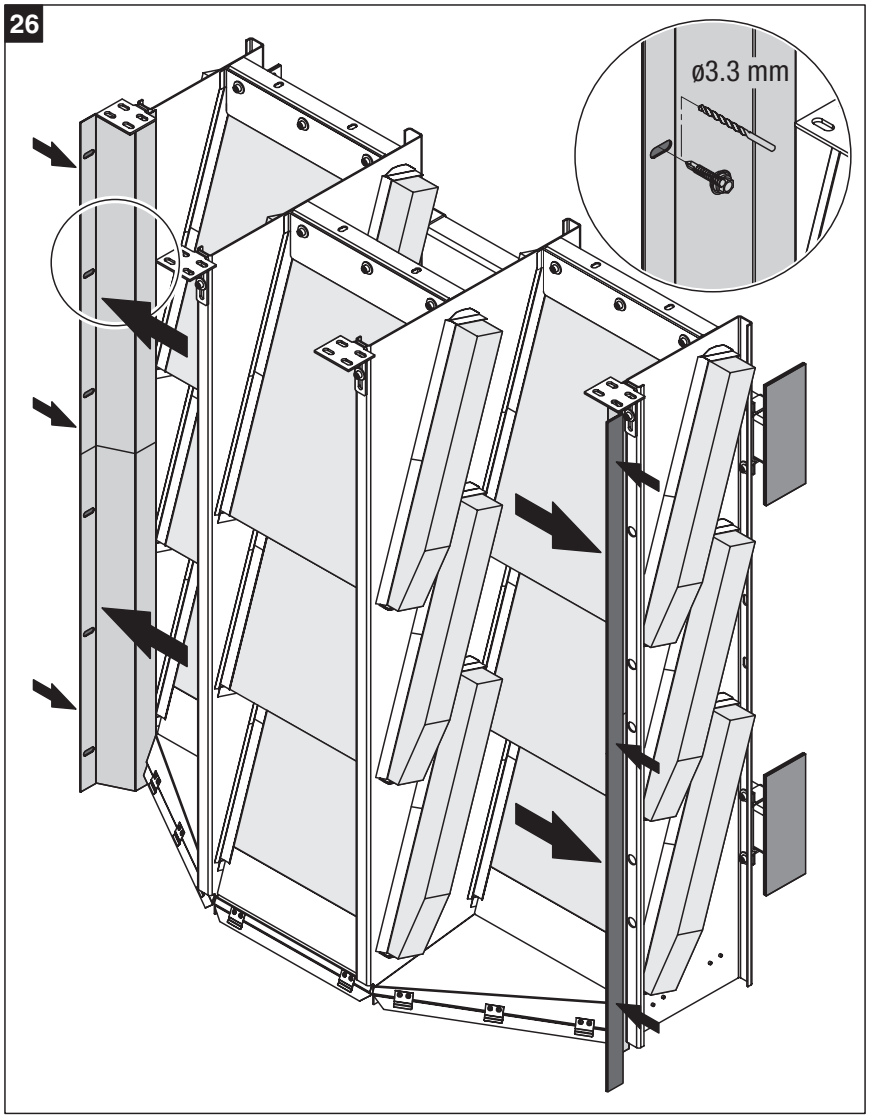


25. Cut the supplied rubber gasket band into pieces of the appropriate length. Use the supplied hexagon socket screws M6x12 mm and the washers to fix the upper flow sheets and the rubber gaskets to the brackets already installed.

Important! Between the vertical sections with system-specific interstice the upper flow sheet marked with a "**V**" must be used.

Install the lateral flow sheets:





26. Fix the two-part lateral flow sheets to the duct wall using the self-tapping screws provided (drill holes ø3.3 mm before). First mount the lower part of the lateral flow sheets, then the upper one (**the upper part must overlap the lower one**).

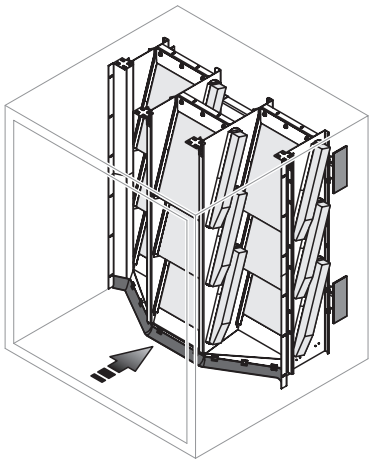
Important! Make sure the lateral flow sheets are flush with the duct roof and the duct floor.

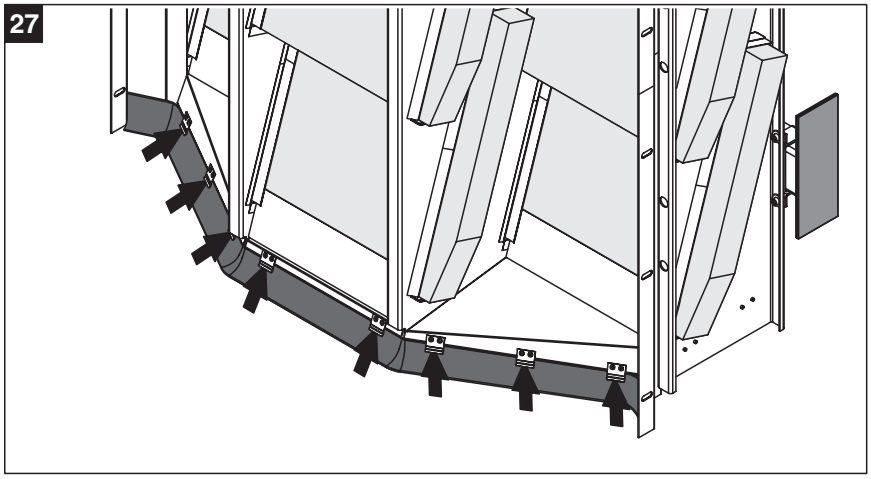
Important! Make sure the lateral flow sheets overlap the vertical sections by a sufficient amount.

Important! Make sure the lateral flow sheets are tightly screwed at every oblong hole.

Finally, seal the junctions between the lateral flow sheets and the duct walls with sealing compound.

Install the tub seal:





27. Cut the whole length of the tub sealing to the appropriate width (width = distance between lower edge of drain-off sheet and bottom of duct plus 30 mm).

    Then, starting on one side of the duct push the tub seal underneath the lashes of the drain-off sheets.

    Important! The tub seal must be installed in one piece (do not cut).

    Important! Make sure the tub seal tightly joins to the duct floor (adjust with knife if necessary) and verify appropriate tightness at both lateral flow sheets.

4.3 Installation of the central unit

Location of the central unit

– The central unit is designed for **wall mounting**. Make sure the construction (wall, pillar, etc.) to which the central unit is to be mounted, offers a sufficiently high load-bearing capacity and is suitable for the installation.

Caution! Do not mount the central unit to vibrating parts.

– The central unit must be installed only in a **location having a water drain** on the floor. If this is not possible, it is mandatory to provide **water sensors** to safely interrupt water supply in case of leakage. Furthermore, choose a suitable location that prevents damage to material assets in case of leakage.

– Make sure the ambient conditions at the desired location meet the specifications outlined in chapter 8.2.

– **Danger of damage!** Do not install the central unit in exposed locations or locations with heavy dust load. Use the optional casing (option “Z408”) to protect the central unit from damage and soiling, or use the central unit with spray circle discharge integrated in two protective cabinets (option “Z409”).

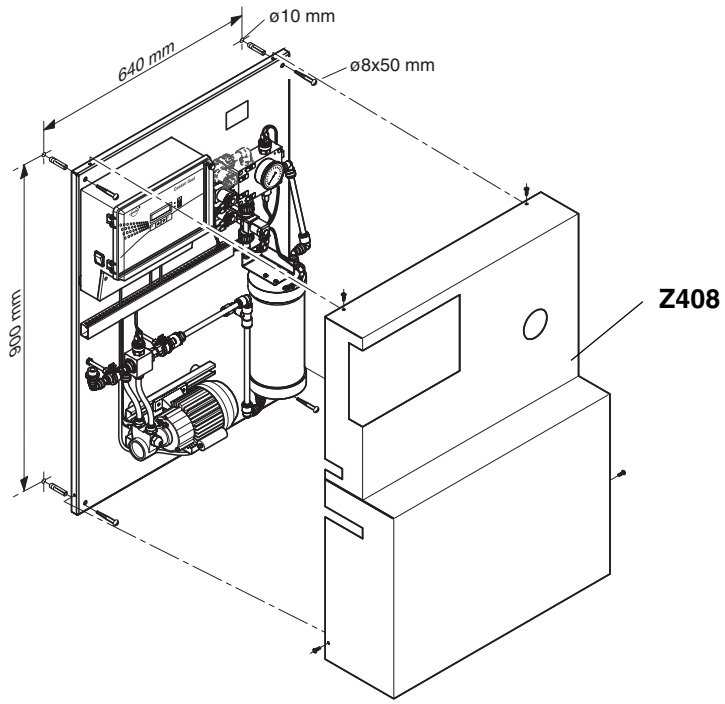
– Install the central unit so that the water hoses between the connector box and the nozzles are as short as possible (**max. 10 m**).

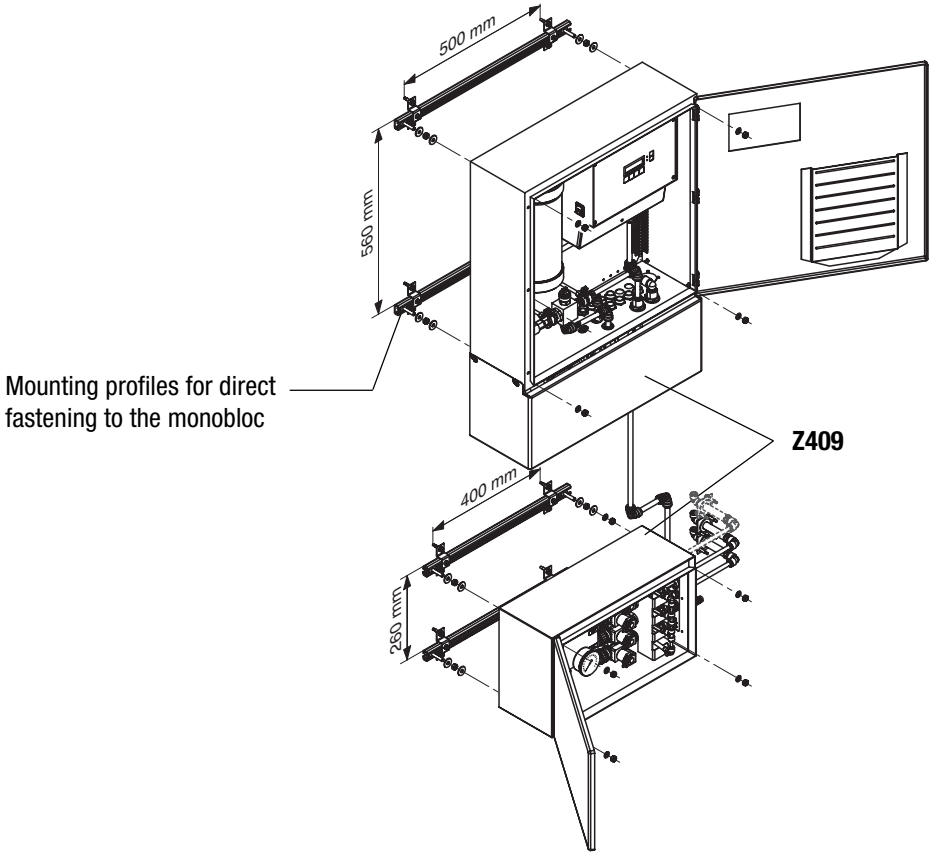
– Install the central unit in a freely accessible location providing enough space for operation and maintenance (**0,5 m minimum clearance around the central unit, distance to floor at least 1 m**).

Installation of the central unit

Use the provided fastening set to mount the central unit to the wall or to the monobloc. If for some special reasons an installation with the supplied fastening material is not feasible, choose a type of installation that is equally stable.

Important! Use a level for accurate horizontal adjustment.

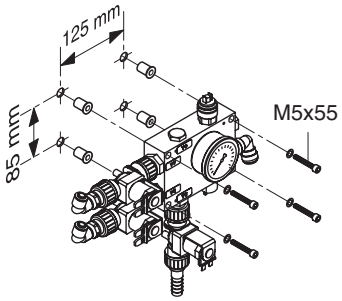




4.4 Installation of the components of the decentralized system

General notes on location and fastening

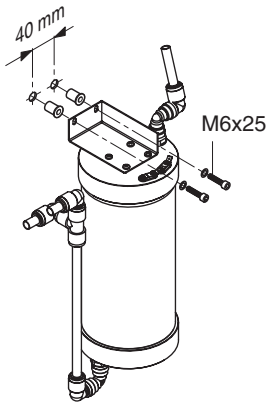
- Locate the system components so that:
  - the distance between particular components is as short as possible and the maximum admissible distance is not exceeded.
  - they are freely accessible, with enough space for operation and maintenance (**0,5 m minimum clearance around the components, distance to floor at least 1 m**).
- The **booster pump**, the **silver ionization unit**, and the **connector box** must be installed only in a **location having a water drain** on the floor. If, for any reason, this is not possible it is mandatory to provide **water sensors** to safely interrupt water supply in case of leakage. Furthermore, install the components in a location that prevents damage to material assets in case of leakage.
- **Danger of damage!** Do not install the components in exposed locations or locations with excessive dust load.
- The **booster pump** is designed for wall mounting while the **control unit**, the **silver ionization unit**, and the **connector box** are designed for **direct fastening to the ventilation duct/monoblock**. Make sure the construction (wall, pillar, housing etc.) to which the components are to be mounted, offers a sufficiently high load-bearing capacity and is suitable for the installation.
  Caution! Do not mount the components to vibrating parts.
- **Use only the provided fastening material** to mount the various components. If for some special reasons an installation with the supplied fastening material is not feasible, choose a type of installation that is equally stable.



Installation of the connector box

Upon delivery the box is ready to be connected. Use the provided fastening material (**4 pan head screws M5x55 mm, 4 spring washers M5**, and **4 blind nuts M5**) to mount the connector box directly to the ventilation duct/ monoblock or to a frame.

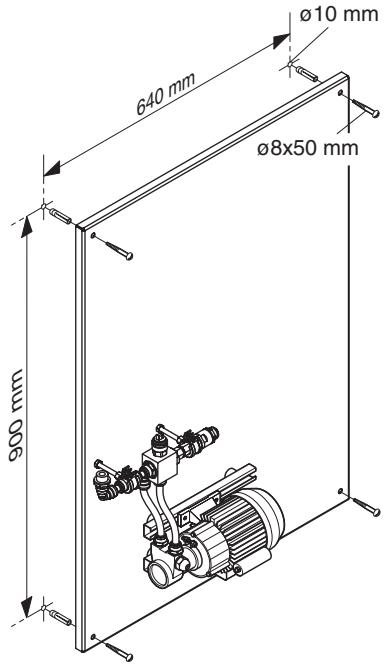
Before mounting the connector box, **read the notes on correct location** and make sure the **length of the water hoses** between the connector box and the nozzles is as short as possible (**max. 10 m**).



Installation of the silver ionization unit

Use the provided fastening material (**2 pan head screws M6x25 mm, 2 spring washers M6**, and **2 blind nuts M6**) to mount the silver ionization unit directly to the ventilation duct/monoblock or to a frame.

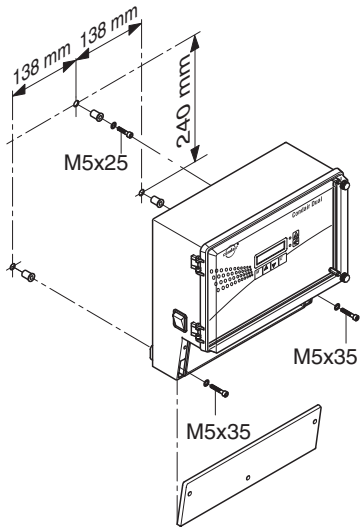
Before mounting the silver ionization unit, **read the notes on correct location** and make sure the length of the **water hoses** to the connector box and the booster pump is as short as possible (**max. 10 m**).



Installation of the booster pump

At the factory the booster pump is fastened to a mounting plate and is therefore ready to be connected as supplied. Use the provided fastening set (**4 round head wood screws ø8x50 mm**, and **4 plugs ø10 mm**) to fasten the mounting plate to a wall, a pillar, or another suitable surface.

Before mounting the booster pump, **read the notes on correct location** and make sure the length of the **water hoses** between the pump and the connector box is as short as possible (**max. 20 m**).



Installation of the control unit

Use the provided fastening material (**2 pan head screws M5x35 mm, 1 pan head screw M5x25 mm, 3 spring washers M5**, and **3 blind nuts M5**) to mount the control unit directly to the ventilation duct/monoblock or to a frame.

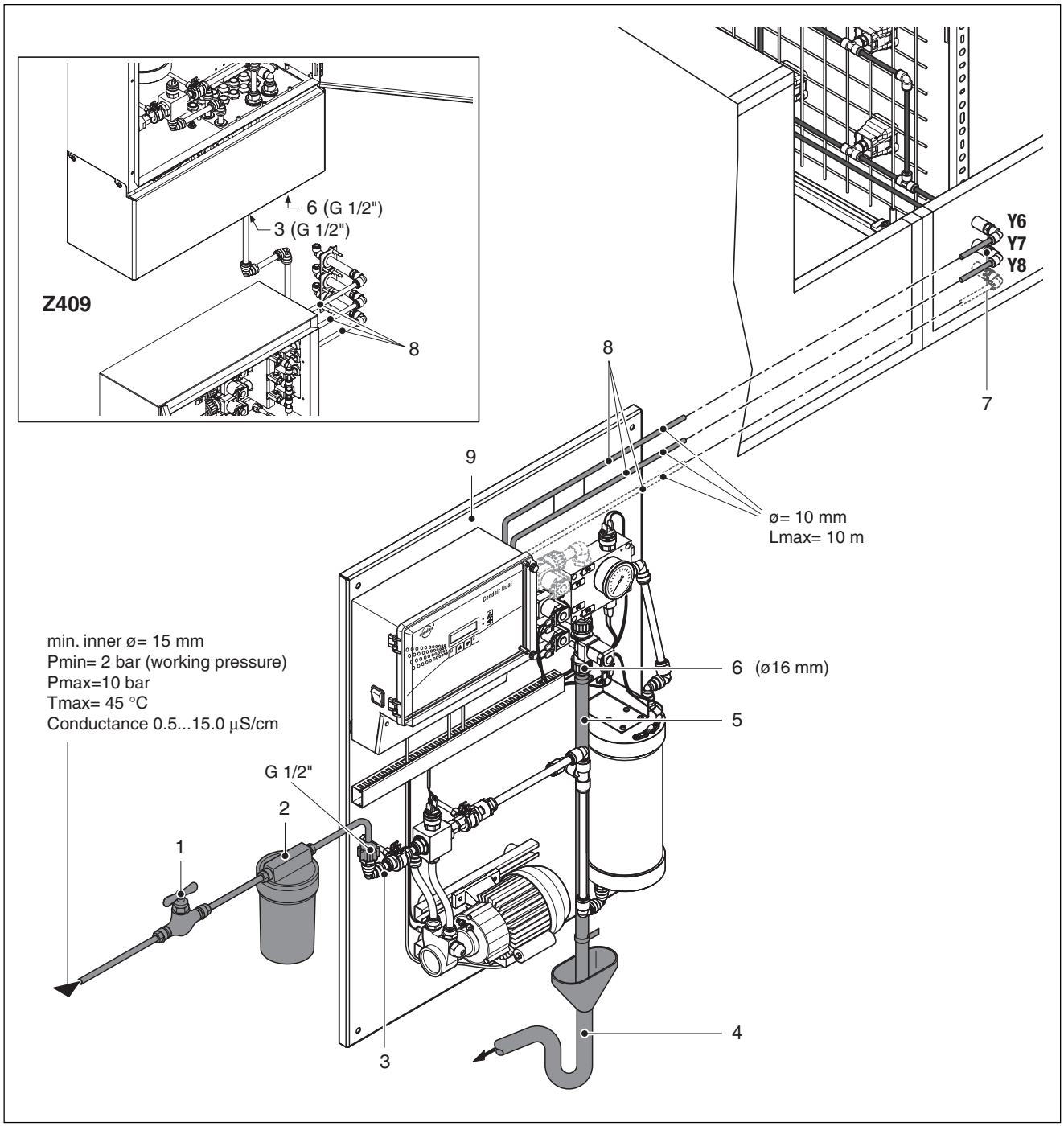
Place the control unit close to the humidification unit. Before mounting the control unit, **read the notes on correct location** and make sure the length of the **electrical wiring** to the connector box, the booster pump, and the silver ionization unit is **as short as possible**.

4.5 Water installation

Water installation of the centralized system

The following illustration shows the water installation of the centralized system. Installations to be carried out are highlighted in grey.

Important! Read and observe the notes on water installation at the end of the current chapter.

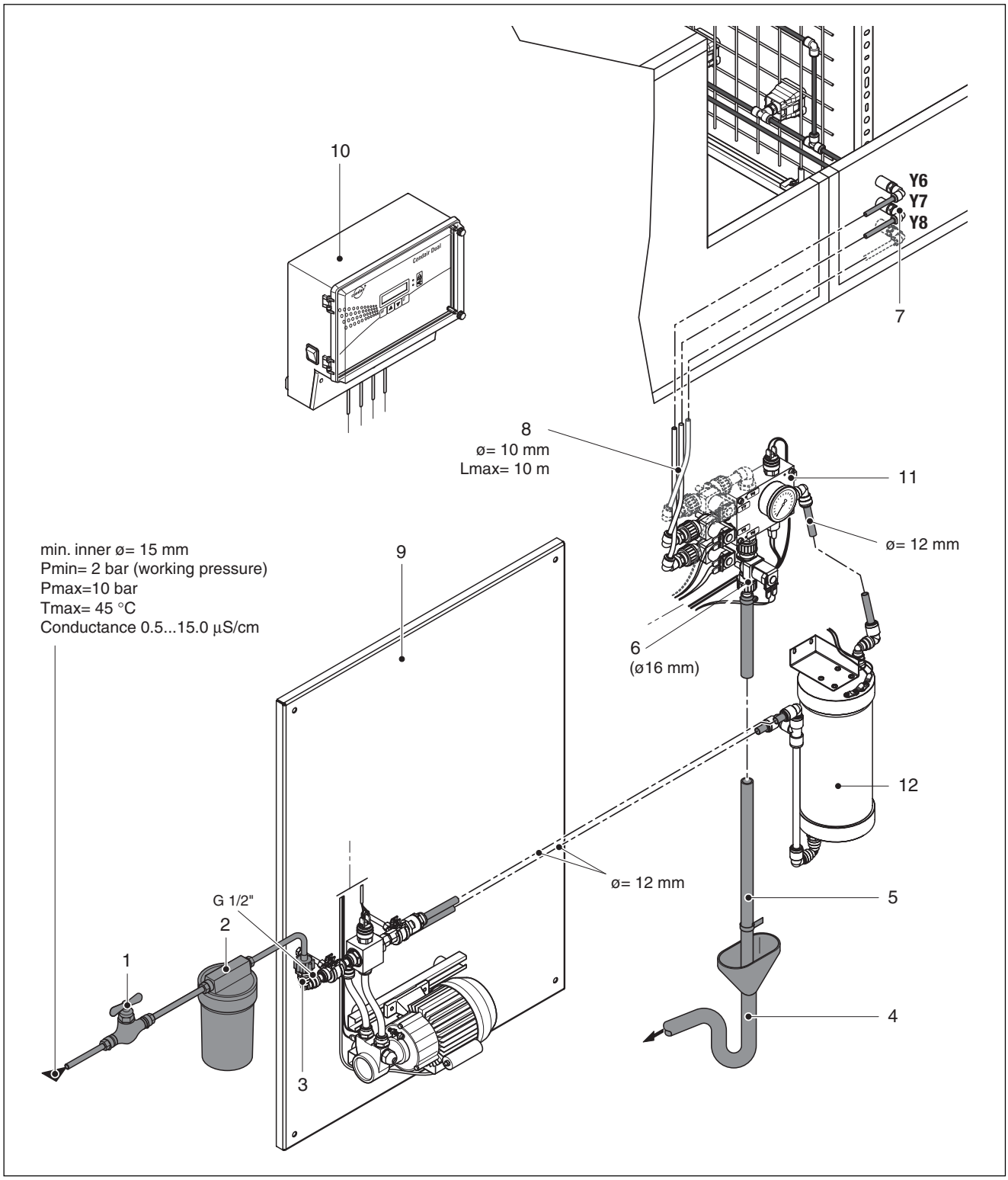


1 Shut-off valve (by customers)
2 Filter (by customers, mesh width 0.125 mm)
3 Connector (G 1/2", outside thread) for fully demineralized water
4 Drain with siphon trap (by customers)
5 Flushing conduit (ø18/16 mm or Z409: ø12/10 mm)
6 Flushing connector (ø16 mm or Z409: G 1/2" outside thread)
7 Nozzle system connectors
8 Spray lines (ø10 mm)
9 Central unit

Water installation of the decentralized system

The following illustration shows the water installation of the decentralized system. Installations to be carried out are highlighted in grey.

Important! Read and observe the notes on water installation at the end of the current chapter.



1 Shut-off valve (by customers)
2 Filter (by customers, mesh width 0.125 mm)
3 Connector (G 1/2", outside thread) for fully demineralized water
4 Drain with siphon trap (by customers)
5 Flushing conduit (ø18/16 mm)
6 Flushing connector (ø16 mm)
7 Nozzle system connectors
8 Spray lines (ø10 mm)
9 Booster pump
10 Control unit
11 Connector box
12 Silver ionization

Notes on water installation

– The installation of the **shut-off valve** and the **filter** (maximum mesh width 0.125 mm) in the fully demineralized water supply conduit is **mandatory**. If possible, both assemblies are to be installed close to the booster pump.

  Before joining the fully demineralized water supply conduit to the water connector, **flush the conduit thoroughly for at least 10 minutes**.

  If the water pressure is >10 bar, install a pressure reducing valve (set to 10 bar) in the supply conduit.

– If the conduit length between the water conditioning unit and the Condair Dual exceeds 20 m, the supply conduit must be equipped with a suitable pressure damper (overflow valve, surge tank, etc.). Furthermore, the supply conduit must be properly fastened according to the regulations.

– The drain hose is fed from the connector box or from the corresponding connection of the protective cabinet (Z409) down into a drain conduit with siphon trap. **Use a hose clamp to attach the drain hose to the nipple of the connector box**. Prevent the drain hose from slipping out of the funnel by fastening it **with appropriate means right above the funnel** (without reducing the diameter of the hose).

– Observe the following **notes on correct installation of the hoses**:

  – Use the supplied black plastic hoses ø8/6 mm, ø10/8 mm and ø12/10 mm only. For hygienic reasons do not use other hoses (except products supplied by Axair).
    Caution! Fully demineralized water is aggressive. For this reason, the entire water system must contain **fully demineralized water resistant material only**.

  – When cutting hoses use an **appropriate cutting tool** providing **straight, kink-free** cuts.
    Caution! After cutting the tubes the sharp cutting edge must be trimmed otherwise the couplings may be damaged.

  – Hoses must be free of kinks and other damage (longitudinal scratches, in particular).

  – When cutting hoses always **add at least 5 mm** to the required length. This way the hoses can be fastened correctly (down to the stop) to the quick-action couplings of the nipples.

  – Make sure the hoses are not kinked and pay attention to the **minimum bend radius of 100 mm**.

  – Do not lead hoses past hot system components (**max. ambient temperature is 40 °C**).

  – To prevent damage we strongly recommend leading the hoses inside a duct (or a similar means of protection) between the connector box and the openings of the casing.

  – After installation verify correct fastening of all hoses. Correctly mounted hoses can not be removed without pressing the locking ring.

Water quality requirements

The fully demineralized water must meet the following requirements:

- **Working pressure at maximum humidification capacity: min. 2 bar**
- **Maximum admissible inlet temperature: 45 °C**
- **No additives** (such as **chlorine, disinfecting agents, ozone,** etc.)
- **Max. germ count at the water inlet on the** Condair Dual: **1000 cfu/ml**
- **Conductance of the supply water: 0.5 ... 15.0 µS/cm**

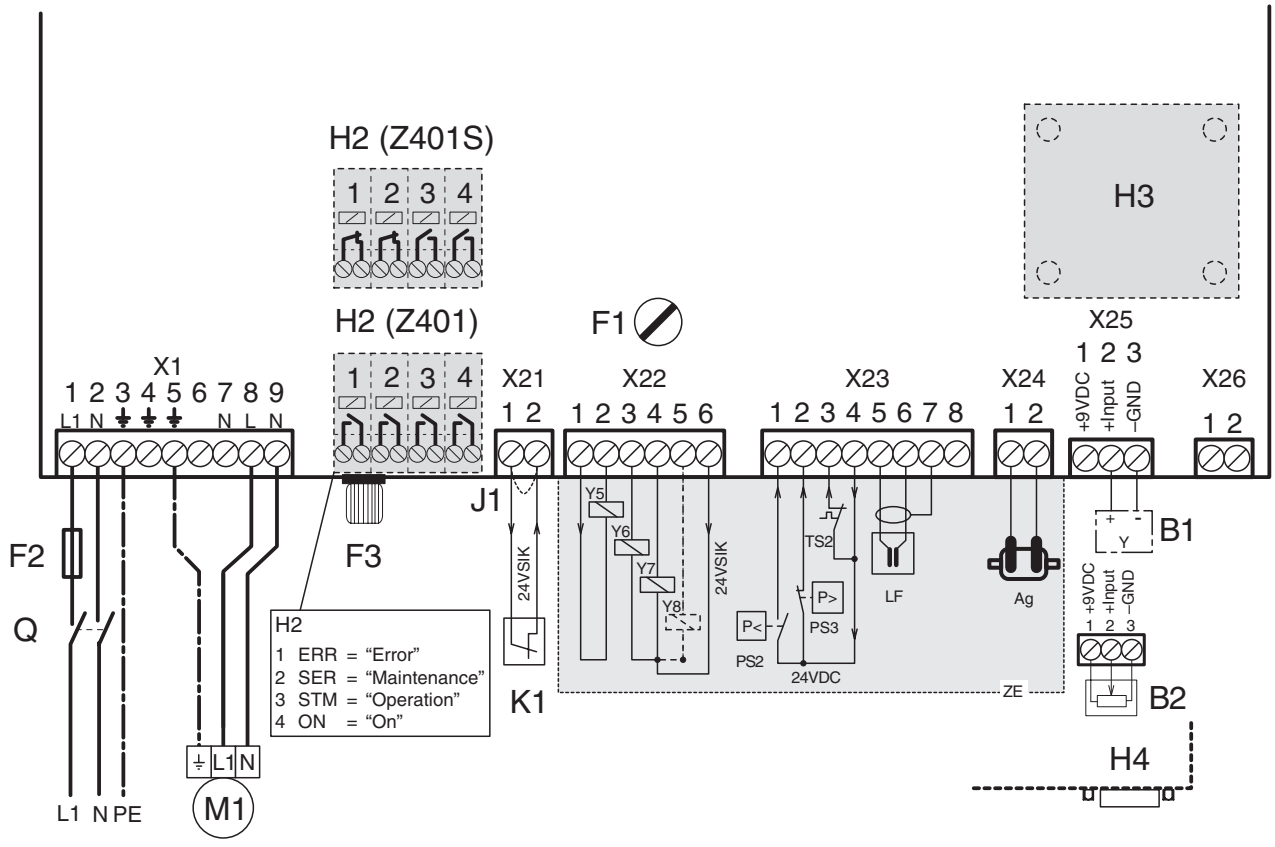
4.6 Electrical installation

All work concerning the electrical installation must be performed only by adequately qualified personnel (electrician or specialist with equivalent training).

Please observe all local regulations concerning the electrical installation.

Wiring diagram (also found on the cover of the control unit)

The following wiring diagram provides an overview of the electrical installation. The diagram applies to both versions of the humidification system. The terminals X1 to X26 are located below the cover of the control unit (fastened with 3 screws). The terminals accept the following **maximum cable cross sections**: **stranded wire 1.5 mm², solid copper wire 2.5 mm²**.



Ag	Silver ionization
B1	Active controller
B2	Passive controller
F1	Fuse 2A slow-blow (control)
F2	Fuse 10A slow-blow (power supply)
F3	Fuse 6.3A slow-blow (booster pump)
H2	Remote operating and fault indication (option Z401 or Z401S–wire breakage safe)
H3	Silver ionization sub-PCB
H4	Serial interface RS232/RS485 (option Z404/Z405)
J1	Jumper (to be installed if no monitoring devices are connected to terminal X21)
K1	External safety circuit (maximum hygrostat, flow control, release, power-off etc.)
LF	Conductance sensor
M1	Booster pump
PS2	Permeate minimum pressure switch
PS3	Permeate maximum pressure switch
TS2	Excess temperature switch of pump
Q	External service switch or plug-in connector
Y6-Y8	Spray valves connector box
Y5	Drain valve connector box
ZE	Central unit

Electrical installation of centralized systems

The electrical installation of centralized systems includes (also see wiring diagram):

Designation/Description	Cable specification
Connection of the **power supply** to terminal X1. The **service switch Q** and the **fuse F2** are mandatory. **Caution!** Make sure the voltage indicated on the rating plate meets the local line voltage. Otherwise, do not connect the control unit.	min. cross section 1.5 mm^2
Connection of the **external safety circuit** (maximum hygrostat, flow control, release circuit, etc.) to terminal X21. **Important!** If no monitoring devices are connected to terminal X21, a jumper (J1) must be installed to the terminal.	min. cross section 0.5 mm^2
Connection of an **external controller or humidity sensor** to terminal X25. (admissible signal values see chapter 8.1 “Specifications”). The shielding of the control signal must be connected to terminal X25/3. **Caution!** If the shielding of the control signal is **already connected to a potential or a grounded conductor, do not** connect it to terminal X25/3.	shielded cable min. cross section 0.25 mm^2

Electrical installation of decentralized systems

The electrical installation of decentralized systems includes (also see wiring diagram):

Designation/Description	Cable specification
Connection of the **power supply** to terminal X1. The **service switch Q** and the **fuse F2** are mandatory. **Caution!** Make sure the voltage indicated on the rating plate meets the local line voltage. Otherwise, do not connect the control unit.	min. cross section 1.5 mm^2
Connection of the **booster pump** to terminal X1.	min. cross section 1.5 mm^2
Connection of the **external safety circuit** (maximum hygrostat, flow control, release circuit, etc.) to terminal X21. **Important!** If no monitoring devices are connected to terminal X21, a jumper (J1) must be installed to the terminal.	min. cross section 0.5 mm^2
Connection of the **solenoid valves Y6-Y8** (on connector box) to terminal X22.	min. cross section 0.5 mm^2
Connection of **minimum pressure switch PS2** (on booster pump), **maximum pressure switch PS3** (on connector box), and **excess temperature switch of booster pump TS2** (on connector box) to terminal X23.	min. cross section 0.5 mm^2
Connection of the **conductance sensor LF** (on connector box) to terminal X23. **Important!** For accurate measurements of the conductance the shielding must be connected to the terminal X23/7.	shielded cable min. cross section 0.25 mm^2
Connection of the **silver ionization** to terminal X24.	min. cross section 0.5 mm^2
Connection of an **external controller or humidity sensor** to terminal X25. (admissible signal values see chapter 8.1 “Specifications”). The shielding of the control signal must be connected to terminal X25/3. **Caution!** If the shielding of the control signal is **already connected to a potential or a grounded conductor, do not** connect it to terminal X25/3.	shielded cable min. cross section 0.25 mm^2

4.7 First-time commissioning

The following steps are carried out upon first-time commissioning:

- Inspecting the installation
- Flushing the water circuits
- Checking the spray nozzles
- Configuring the control unit or the system, respectively
- Carrying out test runs
- Setting up the ionization current and the capacity counter of the silver ionization according to the table in the appendix.

Since first-time commissioning is always done by a service technician of your Condair supplier the current manual does not provide detailed information on this procedure.

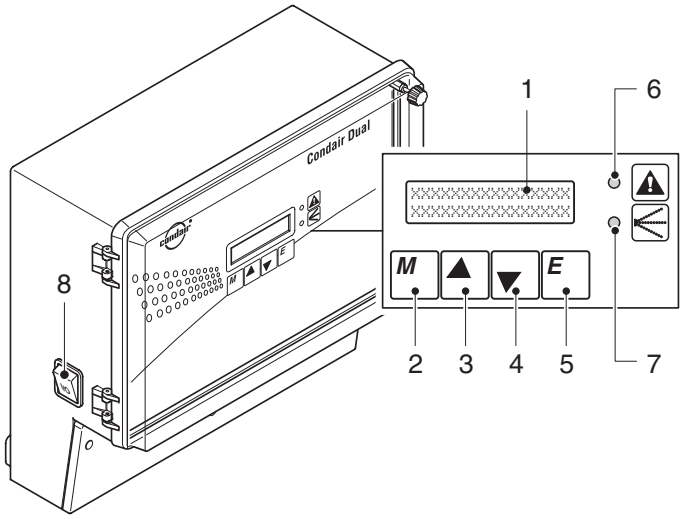
The commissioning protocol with the system configuration data can be found in chapter 9.4.

5 Operation

The Condair Dual Hybrid Humidifier must be commissioned and operated only by personnel familiar with the unit and adequately qualified for the task. Ascertaining the qualification is the customer's responsibility.

5.1 Introduction

The Condair Dual Hybrid Humidifier is operated via the control unit. The control unit provides the following display and control elements:



1 Display
(5x7 dot matrix, 2x16 characters)

2 **<*M*>** key (menu key)

3 **<▲>** key (arrow key up)

4 **<▼>** key (arrow key down)

5 **<*E*>** key (entry key)

6 "Error" indicator (red LED)

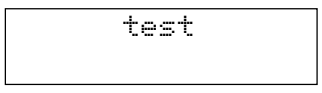
7 "Humidification on" indicator
(green LED)

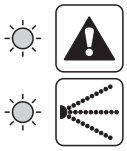
8 **<I/O>** key (power switch)

5.2 Commissioning for daily operation

The following description outlines the commissioning procedure for daily operation. It is assumed that first-time commissioning has been carried out properly by the service technician of your Condair supplier. Proceed as follows to **prepare the Condair Dual Hybrid Humidifier for operation**:

- Check the installation and all system components for damage.
  Caution! Do not put the system into operation in case of damaged installations or system components.
- Make sure the ceramic plates are correctly located and properly sealed.
  Caution! Put the system into operation only if the above requirements are met without fail.
- **Set the mains supply service switch** (power supply to control unit) to "**On**".
- **First set the power switch** of the control unit to "**I**", **then open the shut-off valve** of the water supply conduit. The control system now carries out a basic system test while the "Humidification on" and "Error" indicators light up. Once the test is completed the drain valve opens for approximately 20 seconds (flushing of the permeate conduit).





error XX
XXXXXXXXXXXXXXXX

If a fault is detected during the system test, a corresponding error alert is triggered, i.e. the error indicator either flashes (alarm) or stays on (error), and a corresponding message appears on the display (also see chapter 7.1).

After successful conclusion of the system test, the unit switches to **standby mode** and one of the following displays appears, depending on the current state of operation:

Condair Dual
ready

– The Condair Dual is in standby mode (no humidification).

Condair Dual
humidific. on

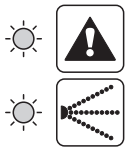
– The Condair Dual humidifies (in addition, the “Humidification on” indicator lights).

Condair Dual
flush.perm.circ.

– Drain valve open, the permeate is led directly to the drain conduit (cause: preset flushing cycle is in progress (every 24 hrs.) or the conductance of the permeate is too high).

ext.safety chain
interrupted

If the external **safety circuit** (maximum hygrostat, flow control, etc.) is interrupted, the opposite message appears and the “Error” and “Humidification on” indicators light up intermittently.



error XX
XXXXXXXXXXXXXXXX

If a **fault** is detected during operation, a corresponding error alert is triggered, i.e. the error indicator either flashes (alarm) or stays on (error), and a corresponding message appears on the display (also see chapter 7.1).

If **maintenance is due** or the **silver ionization electrodes require replacement**, the corresponding message and the current status display appear intermittently.

maintenance
due

– Maintenance due

Ag electrodes
change due

– Silver ionization electrodes worn

Please consult chapter 6 for further information.

Notes on operation

– Make sure the **minimum working pressure never drops below 2 bar** during operation. In case the working pressure drops below the limit, check the reverse osmosis system and the fully demineralized water supply.

– In standby mode the **drain valve is opened for approximately 10 seconds every 24 hours** thus flushing the permeate supply conduit (for the sake of hygiene).

– Humidification is not activated if the humidification request is below 20 % (2-valve connector box) or 15 % (3-valve connector box), respectively.

5.3 Taking the humidifier out of operation

To take the Condair Dual Hybrid Humidifier **out of operation**, e.g. for maintenance purposes, proceed as follows:

- Set the power switch to "**O**".
- **Disconnect the control unit from the mains**: Set the service switch of the mains supply line to "**Off**".
- Close the **shut-off valve** of the water supply conduit.
  Note: If the water supply system requires maintenance **depressurize the water system** first. For this purpose switch the control unit back on again and wait until flushing is concluded and the **alarm message no. 07** "**minimum permeate pressure**" appears on the display. Then, switch the control unit off again, as described above.

- **Mind hygiene! Let the fan of the ventilation system run** until the humidification unit is **dry**.
- In case the humidification unit requires maintenance switch the ventilation system off and secure it against unintentional power-up.

Important information on extended periods of non-use

Important! For reasons of hygiene, we basically recommend that the Hybrid Humidifier should be left switched on, even in periods when there is no requirement for humidification. With the system switched on, the water circuit is flushed at regular intervals and hence the build-up of germs is opposed.

However, if it is necessary to leave the Hybrid Humidifier switched off for **long periods**, the following points should be noted:

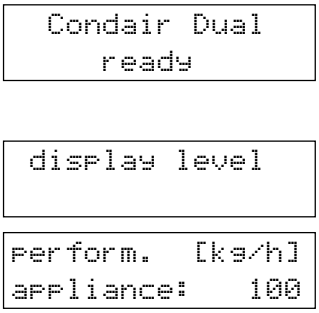
– **Mind hygiene! Drain all water conduits**.

– For safety reasons the **post-evaporation elements should remain in their working position**, even if the humidifier is not used for an extended period. This prevents the water from being sprayed directly into the duct in case the humidifier is powered up inadvertently.

5.4 Inquiring operating parameters

The Condair Dual provides a so-called **display level** used for **inquiring various operating parameters**. However, the display level does not let you change the parameters.

Accessing the display level



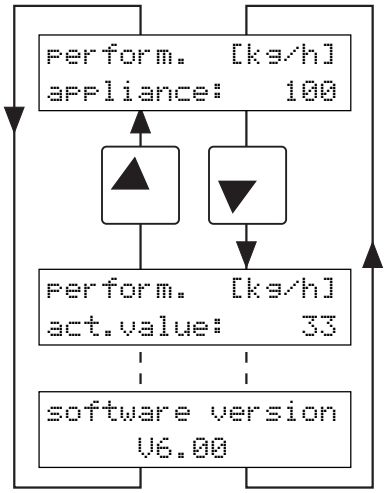
The Condair Dual is in **standard operation mode** (the display of the control unit shows the current state of operation).

- Press the **<*E*>** or **<*M*>** key to access the display level.

The opposite confirmation appears briefly on the display.

Then, the first parameter of the display level shows up.

Selection of parameters in the display level



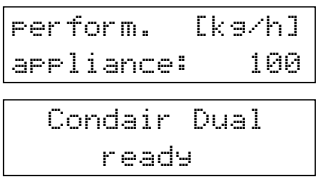
- Use the **<▼>** and **<▲>** keys to select the desired parameter:

  <▼>: next parameter

  <▲>: previous parameter

Note: The display level is an endless loop, i.e. stepping forward from the last parameter automatically brings up the first parameter again.

Quitting the display level



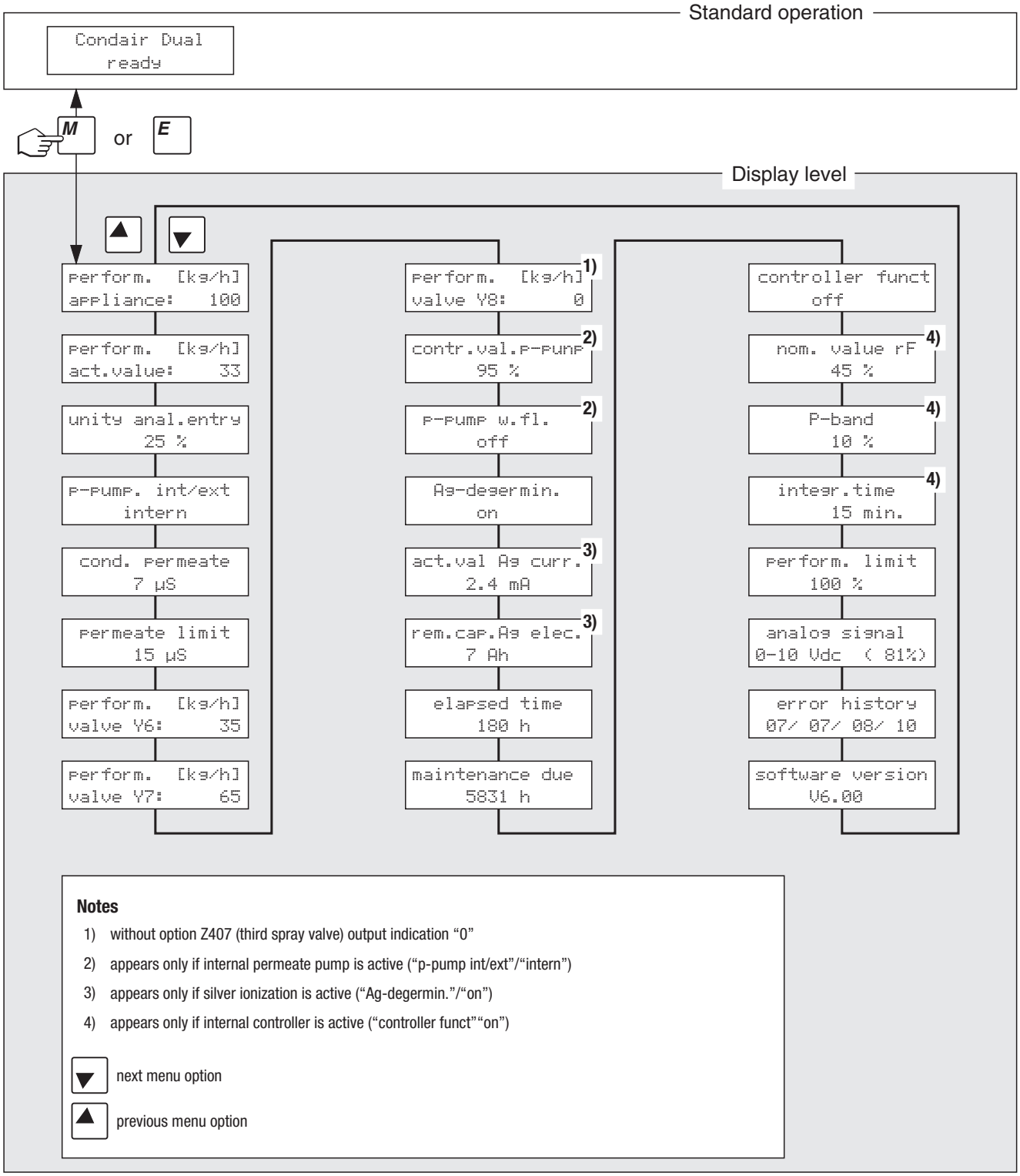
Proceed as follows to escape from the display level:

- Press the **<*M*>** or **<*E*>** key.

The control unit returns to the status display.

Note: If no key is pressed in the display level for 10 minutes, the control unit automatically returns to the status display.

Overview of the display level



Description of display level parameters

The following description explains the parameters that may be accessed via the **<▼>** and **<▲>** keys once the display level has been launched (with the ***<M>*** or ***<E>*** key).

```
perform.  [kg/h]
appliance:   100
```

– **Maximum humidification output**

Maximum spraying capacity in kg/hr.

```
perform.  [kg/h]
act.value:    33
```

– **Current humidification output**

Current spraying capacity in kg/hr.
Note: The actual spraying capacity may differ from the displayed value depending on the current spraying pressure.

```
unity anal.entry
       25 %
```

```
unity anal.entry
       25 %
```

– **Analog input (humidification request)**

Current signal value at the analog input in % of the maximum value.
Note: If the internal controller is active the displayed value corresponds to the current ambient humidity in %rh.

```
p-pump. int/ext
     intern
```

– **Booster pump internal/external**

This display indicates whether the control unit is configured to work with an **internal** or **external** booster pump.

```
 cond. permeate
      7 µS
```

– **Conductance**

Current conductance of the permeate in µS.

```
 permeate limit
      15 µS
```

– **Permeate limit**

Selected limit value of permeate conductance in µS.
Note: If this value is exceeded in operation, the drain valve (Y5) of the connector box is opened until the conductance of the permeate drops below the given limit value again.

```
perform.  [kg/h]
valve Y6:    35
```

– **Spraying capacity of spray valve 1**

Nominal spraying capacity of open spray valve 1 (Y6) in kg/hr (at a spraying pressure of approximately 7 bar).

```
perform.  [kg/h]
valve Y7:    55
```

– **Spraying capacity of spray valve 2**

Nominal spraying capacity of open spray valve 2 (Y7) in kg/hr (at a spraying pressure of approximately 7 bar).

```
perform.  [kg/h]
valve Y8:    75
```

– **Spraying capacity of spray valve 3 (option)**

Nominal spraying capacity of open spray valve 3 (Y8) in kg/hr (at a spraying pressure of approximately 7 bar).
Note: A nominal spraying capacity value of 0 is displayed if the optional spray valve 3 is not available.

```
contr.val.p-pump
      95 %
```

– **Starting point of booster pump**

Starting point of the booster pump in % of the maximum humidification request.
Note: This parameter is available only if the control unit is configured to work with an internal booster pump.

```
P-pump w.fl.
     off
```

– **Booster pump on/off status while flushing**

This parameter indicates whether or not the booster pump runs during the flushing cycle of the permeate conduit.
Note: This parameter is available only if the control unit is configured to work with an internal booster pump.

```
 Ag desermin.
     on
```

– **Silver ionization on/off**

This parameter indicates whether the silver ionization (disinfection) is activated (**on**) or deactivated (**off**).

```
act.val Ag curr.
    2.4 mA
```

– **Current of silver ionization**

Actual current of silver ionization in mA.
Note: This parameter is available only if the silver ionization is active.

```
rem.cap.Ag elec.
     7 Ah
```

– **Remaining capacity of silver electrode**

Remaining capacity of silver electrode in Ah.
Note: This parameter is available only if the silver ionization is active.

```
 elapsed time
    180 h
```

– **Working hour meter**

Working hours elapsed since first-time commissioning of the Condair Dual.

```
maintenance due
    5831 h
```

– **Remaining time until maintenance is due**

Hours remaining until next maintenance is to be carried out.
Note: The time displayed refers to 100% humidification output. If current operation requires less output, the maintenance intervals may be extended accordingly.
Regardless of the remaining time display, a complete maintenance has to be carried out once a year (see chapter 6).

```
controller funct
     off
```

– **Internal controller**

Internal controller activated (**on**) or deactivated (**off**).
Note: The internal controller may be activated from within the display level (see chapter 5.5).

```
 nom. value rH
     45 %
```

– **Nominal value of relative humidity**

Preset nominal value of relative humidity in % rh.
Note: This parameter is available only if the internal controller is active.

```
     P-band
      10 %
```

– **Proportional range of the internal controller**

Preset proportional range (P-range) of the internal controller in %.
Note: This parameter is available only if the internal controller is active.

```
integr.time
     15 Min.
```

– **Integral time of internal controller**

Preset integral time of the internal controller in minutes.
Note: This parameter is available only if the internal controller is active.

```
perform. limit
    100 %
```

– **Output limitation**

Preset limit value of output in % of the maximum output capacity.

```
 analog signal
0-10 Vdc  ( 81%)
```

– **Analog signal**

Range of the selected analog signal in V or mA, respectively.
Note: The value in brackets is the current value in % of the maximum signal or the current ambient humidity in %rh, respectively.

```
 error history
 07/ 10/ 08/ 07
```

– **Error history**

Numeric codes of the 4 most recent errors (example: “07”: last error, “10”: second to last error, etc.).
Note: Information on the meaning of error codes is given in chapter 7.

```
software version
    V6.00
```

– **Software version**

Current version of the control unit software.

5.5 Setting up operating parameters

In the **setup level** you may adjust various operating parameters to adapt the Condair Dual Hybrid Humidifier to your particular requirements.

Important! The adjustments made in the setup level immediately exercise an influence on the operating characteristics of the hybrid humidifier. Therefore, adjustments must be made only by persons having sufficient knowledge in the field of humidification and air-conditioning technology and being familiar with the Condair Dual Hybrid Humidifier.

Accessing the setup level

```
 Condair Dual
    ready
```

The Condair Dual is in **standard operation mode** (the display of the control unit shows the current operating status).

- Simultaneously press the **<▼>** and **<▲>** keys to access the setup level.

```
    entry
 setup level
```

The opposite message is displayed briefly.

```
  entry code
    0999
```

You are now prompted to enter the 4-digit access code. The leftmost digit flashes.

```
  entry code
    8099
```

- Enter the access code “**8808**” as follows:

  Change the first digit using the **<▼>** and **<▲>** keys. Confirm your entry with the ***<E>*** key. The next digit starts flashing.

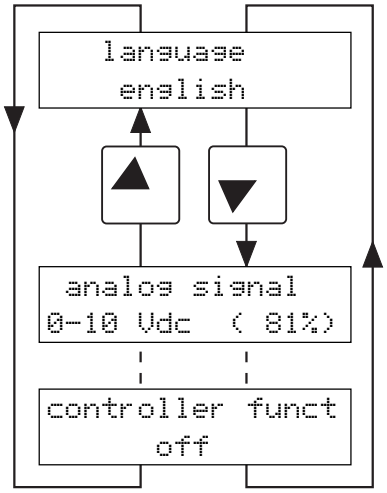
  Repeat this step to change the remaining digits.

Condair Dual
setup level

Following entry of the last digit the opposite message is displayed briefly to confirm access to the setup level.
Note: If you entered an erroneous code the message "**incorrect code**" briefly appears on the display, and subsequently you are asked to re-enter the access code.

language
english

Once you have accessed the setup level, the first parameter is displayed without delay.



Selection of parameters in the setup level

- Use the **<▼>** and **<▲>** keys to select the desired parameter:

  <▼>: next parameter

  <▲>: previous parameter

Note: The setup level is an endless loop, i.e. stepping forward from the last parameter automatically brings up the first parameter again.

Changing parameters

The control unit is in the setup level.

language
english

- Press the ***<E>*** key if you wish to change the current setting. The current setting starts flashing.

Sprache
deutsch

- Press the **<▼>** or **<▲>** key to change the setting.
- Confirm the new setting by pressing the ***<E>*** key.

new value
deutsch

Following confirmation of your entry, the opposite message briefly confirms the new value.
Important! Wait until this message confirms the new setting before accessing the next parameter. Otherwise, the modified setting will not be stored.

old value
english

Note: If you press the ***<E>*** key to confirm the current setting without modification, the opposite message is displayed briefly.

Quitting the setup level

Proceed as follows to escape from the setup level:

language
english

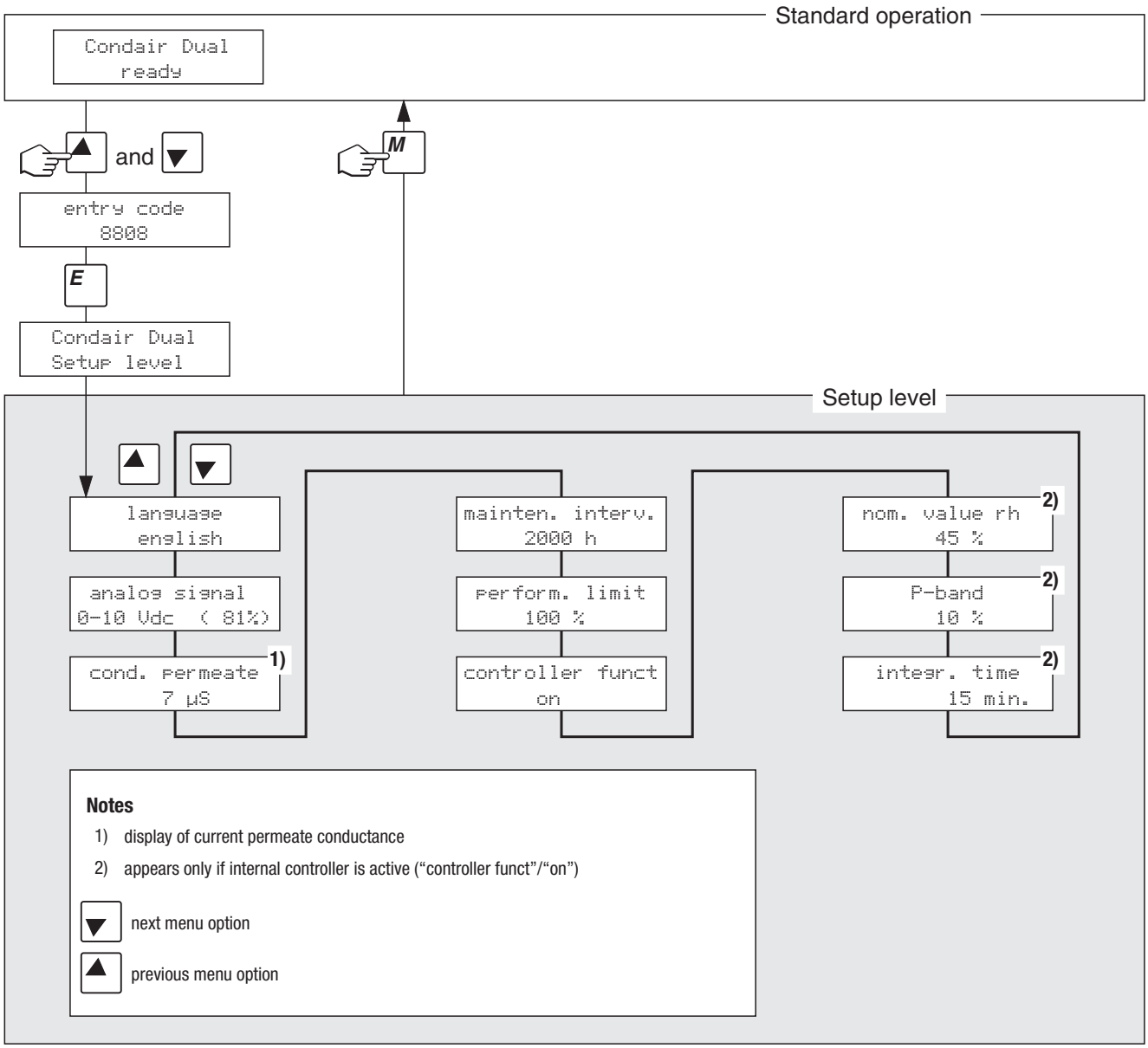
- Press the ***<M>*** key.

Condair Dual
ready

The control unit returns to the status display.
Important! All settings that have been modified and confirmed with the ***<E>*** key before quitting the setup level are stored automatically.

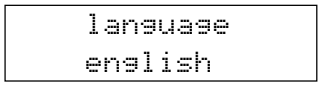
Note: If no key is pressed in the setup level for 10 minutes, the control unit automatically returns to the status display.

Overview of the setup level



Description of setup level parameters

The following description explains all parameters that may be accessed and modified one after the other once the setup level has been launched.



– **Language**

Selection of the control unit's dialogue language.

Factory setting: **English**

Optional settings: **German**, **English**, **French**, **Dutch**, and **Danish**

Note: Following confirmation of the selected language the control unit switches to the appropriate language without delay.

```
 analog signal
0-10 Vdc  ( 81%)
```

– **Analog signal**

Selection of the analog signal range.

Factory setting: **0-10 Vdc**

Optional settings: **0-20 Vpa** (phase-control), **0-10 Vdc**, **2-10 Vdc**, **0-5 Vdc** (step control board), **1-5 Vdc**, **0-1 Vdc**, **0-20 mA**, **4-20 mA** and **0-8.2 Vdc**

Note: The value in brackets is the current value in % of the maximum signal or the current ambient humidity in %rh, respectively.

Caution! The signal ranges **0-20 mA** and **4-20 mA** must be selected only if a sensor operating at current signals is used, otherwise the control may be damaged.

```
cond. permeate
     7 µS
```

– **Display of current permeate conductance**

Note: Display function only, no setting options.

```
mainten. interv.
    2000 h
```

– **Maintenance interval**

This setting determines in what intervals the display will be prompting you for maintenance.

Factory setting: **2000 hours**

Optional settings: **2000**, **4000**, **6000**, **8000** or **10000 hours**

```
 perform limit
    100 %
```

– **Output limitation**

Sets the output-limit value in % of the maximum output capacity.

Factory setting: **100 %**

Setting range: **10 - 100 %**

Note: This parameter may be used to limit the maximum output in case the humidification capacity of the hybrid humidifier exceeds the current humidification requirements of the facility.

```
controller funct
     off
```

– **Controller function**

Activation (on) or deactivation (off) of the internal PI controller.

Factory setting: **off**

Optional settings: **on** (PI controller active), **off** (PI controller inactive)

Caution! Do not activate the internal controller if an external controller is connected. The internal controller interprets the analog signal of the external controller as the actual humidity value captured by a sensor. If the analog signal is 0% in this case, the internal controller activates 100% humidification capacity which could lead to excessive humidification.

```
nom. value rF
     45 %
```

– **Nominal value of relative humidity**

Setting of the nominal humidity value in %rh.
Note: This parameter is available only if the internal PI controller is active.

Factory setting: **45 %rh**

Setting range: **10 - 100 %rh**

```
P-band
  10 %
```

– **Proportional range (P-range) of the internal PI controller**

Sets the proportional range of the internal PI controller in %.
Note: This parameter is available only if the internal PI controller is active.

Factory setting: **10 %**

Setting range: **4 - 100 %**

Note: The proportional range is used to smoothen the control characteristic. The larger the selected P-range, the smoother the control characteristic will be. However, this results in a permanent control deviation, proportional to the bandwidth of the P-range. For further information please refer to chapter 9.1.

```
integr.time
   15 Min
```

– **Integral time** of the internal PI controller

Determines the integral time of the internal PI controller in minutes.
Note: This parameter is available only if the internal PI controller is active.

Factory setting: **15 minutes**

Optional settings: **off** (no integral time), **2 - 100 minutes**

Note: The integral time setting determines the period allowed to reach the nominal humidity. Setting the integral time to the optimal value prevents the control characteristic from overshooting and, at the same time, balances the permanent deviation (caused by the proportional range setting). For further information please refer to chapter 9.1.

6 Maintenance and replacement of parts

6.1 Maintenance safety instructions

- **All maintenance work must be performed only by adequately qualified and trained personnel** familiar with the dangers involved. Ascertaining the qualifications is the customer's responsibility.
- Instructions and details concerning the maintenance work must be observed and adhered to without fail.
- Only the type of maintenance work outlined in this documentation must be carried out.
- Use original Condair spare parts exclusively to replace defective parts.
- **Before maintenance is initiated, the hybrid humidifier must be taken out of operation in accordance with instructions in chapter 5.3 and protected against unintentional switching on**. Before servicing the humidification unit, the ventilation system must be set out of operation (consult the documentation of the ventilation system).

6.2 Important notes on maintenance

The Condair Dual Hybrid Humidifier incorporates the very latest technology, and has been designed to guarantee **hygienically trouble-free operation** when **operating conditions are observed**. The hygiene during operation was tested, proven and confirmed by the award of the **Fresenius Hygiene Certificate** following long-term tests at the Fresenius Institute.
To ensure operational safety and to guarantee hygiene in long-term operation, the **maintenance concept for the Condair Dual** has been structured in **two stages**. This differentiates between **periodical checking** and the implementation of a **total hygiene service** of the Hybrid Humidifier.

Note: Axair Ltd. offers maintenance contracts. Please contact your Axair representative for an offer.

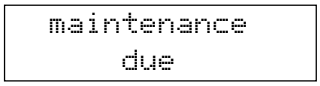
Periodical checking

Periodical checking should be carried out **monthly** and include the following steps:

Item	Work to be carried out
Nozzle system	– **Check the spray pattern of the spray nozzles** (spray cone: optimum 90°, 60° acceptable). If necessary, clean the spray nozzles (see full servicing guide). – **Check hoses and connections for sealing**, if necessary, replace defective components.
Post evaporation unit	– **Check ceramic plates for breakage**. Damaged plates should be replaced (see full servicing guide). Note: A grey discoloration of the ceramic plates is normal. This is due to deposits from the silver ionization.
Central unit – Silver ionization – Connection box – Booster pump	– **Silver ionization**: see detailed information in chapter 6.4. – **Check the hoses and connections** on the booster pump, the silver ionization and the connection box **for sealing**. Replace defective components where necessary.
Humidifier housing/ Water container	– **Check the water container and humidifier housing for soiling** (Rust, slime, dust), clean if necessary (see full servicing guide). – **Check the water container behind the post evaporation unit for collection of residual water**. If residual water is present, check the water drain and the post evaporation unit.
Maintenance record	– Read off the **operating parameters**, including "**Fault history**", on the display level and enter the values on the **maintenance record sheet**.

Total hygiene service of the hybrid humidifier

The frequency of the implementation of a total hygiene service depends on the operating conditions. The state of the humidifier's hygiene and its components mostly depends on the quality of the humidifier water, the performance (and the frequency of replacement) of the filter installed before the unit, the air velocity, the air temperature, and the microbiological and chemical composition of the inlet air.



The basic rule is: when the "Maintenance due" message appears, or at least once a year, the implementation of a total hygiene service is obligatory.

Resetting the "Maintenance due" message

Upon completion of the total hygiene service the **"Maintenance due" message** may be **reset** as follows: Make sure the control unit is switched off, then **press and hold any key while switching the control unit on**. Keep the key depressed (approx. 5 seconds) until the **red error LED** lights up briefly (approx. 1 second).

Item	Work to be carried out
Nozzle system	– **Switch on the individual spray circuits manually and check the spray pattern of the spray nozzles** (spray cone: Optimum 90°, 60° permissible). Remove spray nozzles with a poor spray pattern (see Chapter 6.3.2) and clean them in an ultrasonic bath. – **Check hoses and connections for sealing**, if necessary, replace defective components. – **Check spray nozzles for secure seating**. Slightly tighten loose jets with open-end spanner (width 16 mm).

continued on next page

Item	Work to be carried out
Post evaporation unit	– **Check ceramic plates for breakage**. Damaged plates should be replaced (see Chapter 6.3.1). – **Check ceramic plates for soiling**. Severely soiled plates should be replaced. Note: A grey discoloration of the ceramic plates is normal. This is due to deposits from the silver ionization. If the ceramic plates show severe deposits of dust, the ventilation system air filter should be checked for cracks, cleanliness and filter quality (min. F6 or EU6). – **Check the supporting structure, the ceramic plates, the plate sealings, the flow sheets and the drain-off sheets for correct assembly and tight seating of screw connections**. If necessary, install faulty components correctly (see Chapter 4.2.2) and tighten loose screw connections.
Central unit – Silver ionization – Connection box – Booster pump	– **Check the water filter in the feed line** and clean if necessary. – **Silver ionization**: see detailed information in chapter 6.4. – **Check the hoses and connections** on the booster pump, the silver ionization and the connection box **for sealing**. Replace defective components where necessary.
Humidifier housing/ Water container	– **Check the water container behind the post evaporation unit for collection of residual water**. In the event of a substantial amount of residual water, check the water drain and post evaporation unit. Please note: drops of water and small pools of water in the water tray behind the post-evaporation unit are as a rule caused by the system. – **Clean the water container and humidifier housing (also clean behind the post evaporation unit) with a combined detergent and disinfectant, e.g. "Almu 18" (available from your Condair dealer) or clean with a similar medium**. Finally rinse all components with hygienically pure water (humidifier water) and rub dry.
Electrical installation	– **Inspect connections and cables**. Arrange for a qualified specialist to rectify defective installations.
Humidifier water/ Water treatment	– **Determine the bacterial count at the water connection to the central unit**. In the event of **bacterial count** concentrations above the limit of 1000 cfu/ml (in accordance with the hygiene certificate), the water supply/ water pipes must be subject to a microbiological inspection and appropriate action must be taken immediately (please contact your Condair dealer). **Bacterial count** concentrations in the upper area of the permitted range may be an indication of the onset of bacterial problems in the water supply. The water supply and water pipes should also be subject to a microbiological inspection. – **Inspect the water treatment plant** (salt available, lines sealing, conductance satisfactory?).
System air	– **Determine the bacterial count in the supply air before the humidifier inlet.** In the event of **bacterial count** concentrations above the limit of 1000 cfu/m^3 (in accordance with the hygiene certificate), the ventilation system must be subject to a microbiological inspection and appropriate action must be taken immediately to rectify the situation (please contact your Condair dealer). **Bacterial count** concentrations in the upper area of the permitted range may be an indication of the onset of bacterial problems in the ventilation system. The ventilation system should also be subject to a microbiological inspection. – **Determine the bacterial count in the air at the humidifier outlet to confirm the hygienic function of the hybrid humidifier**.
Maintenance record	– After the full servicing, read off the **operating parameters**, including "**Fault history**", on the display level and enter the values on the **maintenance record sheet**. Finally, reset the servicing indicator.

Notes on cleaning agents

– **Caution!** Strictly observe the information and instructions supplied with the cleaning agents.

– **Caution!** Do not use solvents or toxic cleaning agents.

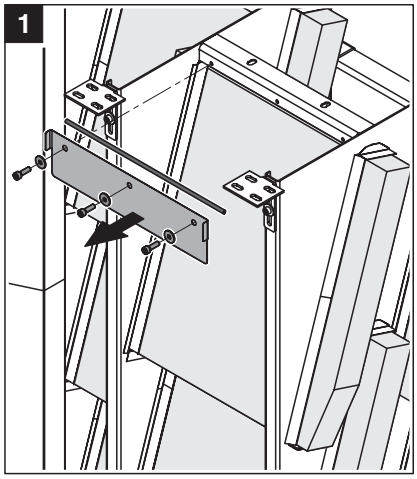
6.3 Removal and installation of components

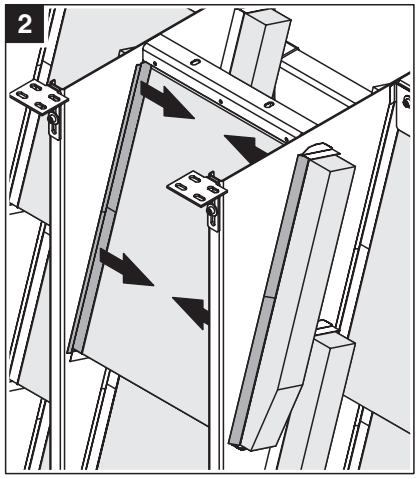
6.3.1 Removal and installation of ceramic plates

Removal of ceramic plates

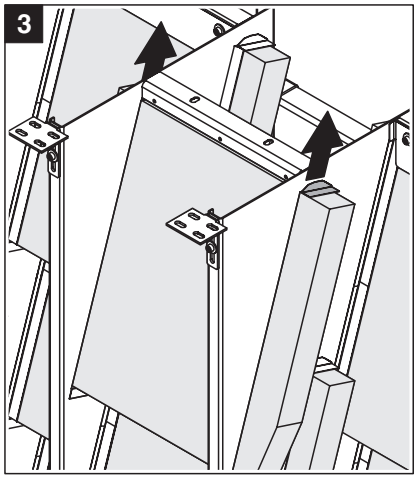
Note: If the ceramic plates of a rear row (viewed in flow direction) must be removed, the ceramic plates of the adjacent front rows must be dismantled first. The removal sequence of the ceramic plates is always from top to bottom.

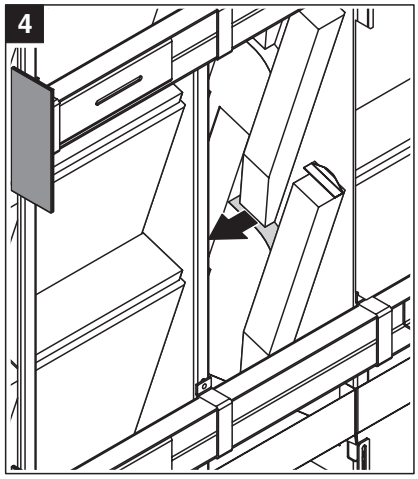
Proceed as follows to remove the ceramic plates of a row:



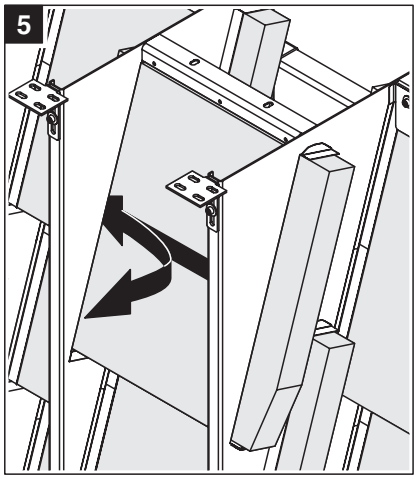


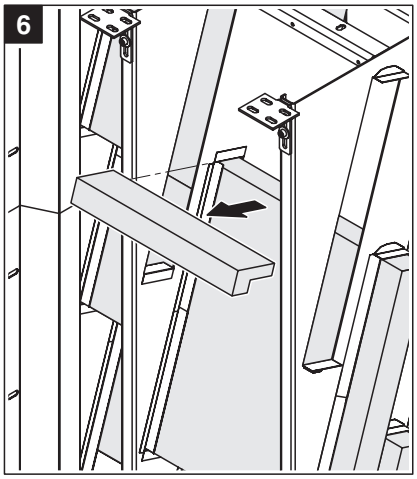
1. Loosen the screws, then remove the upper flow sheet.
2. On both sides remove the two-part lateral plate sealings of the topmost ceramic plate (or the respective ceramic plate, respectively).





3. Push upper plate sealings upwards until they come to a stop.
4. Remove the anti-drip sheet(s) (only on rear plate rows and if present).





5. Carefully pull the ceramic plate out of one vertical section, slightly tilt the plate forward, then withdraw it from the other vertical section.
6. Remove the ceramic angle(s) located on top of the next ceramic element.

Repeat steps 2 to 6 until all ceramic plates of a row are removed.

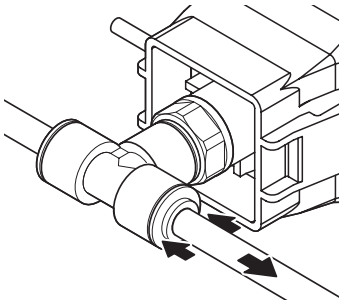
Installation of the ceramic plates

Before installation, check all ceramic plates and ceramic angles for possible damage. Damaged ceramic plates and ceramic angles **must not be reinstalled**.

For installation of the ceramic plates proceed in the reverse order of removal (also see section “Installation of the post-evaporation elements” of chapter 4.2).

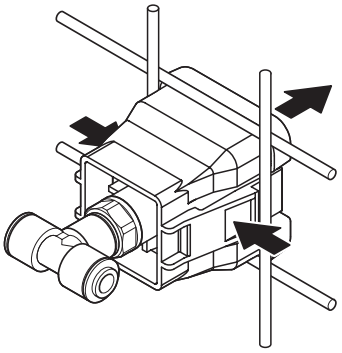
Important! Make sure to reinstall the ceramic plates in the appropriate locations (according to the **overview section of the installation drawing**) and to install all plate sealings correctly.

6.3.2 Removal and installation of the spray nozzles

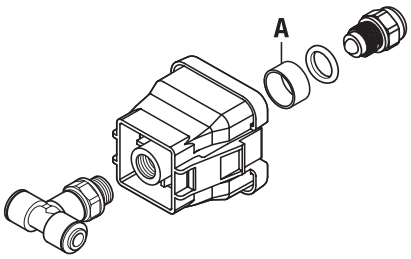


Removal of the spray nozzles

- Remove the hose(s) from the spray nozzle (press the locking ring towards screw, then pull hose off).



- Squeeze the catch locks of the nozzle support and remove the support. Note: The nozzles may have different spraying capacities (max. 2 different capacities per system). Nozzles with identical capacity are marked with bushings of the same color (A). We recommend you note the positions and capacities of all nozzles before removal.



- Use an open-end wrench (16 mm) to loosen and remove the nipple and the nozzle.

Installation of the spray nozzles

Before installation check all parts for possible damage. **Damaged components must not be reinstalled**.

Replace all sealings of the nozzle with new ones.

Important! Flush all conduits with fully demineralized water before assembling the unit.

For installation proceed in the reverse order of removal.

– Make sure to install the nozzles in their correct positions in the nozzle lattice (see installation drawing).

– Following installation verify correct fastening of all hose connectors. Correctly mounted hoses can not be removed without pressing the locking ring.

6.4 Replacement of silver ionization “Hygieneplus”

On commissioning, the current of the silver ionization must be adjusted by the technician in accordance with the table in chapter 9.4. Following the results of a germ test the settings may be changed at any time later on.

Ag electrode change due

If the silver ionization cartridge needs to be replaced (capacity counter reads 0) the display alternately shows the standard operation mode display and the opposite message. In case the control unit is equipped with the optional remote operation and fault indication PCB, the latter additionally issues an error. **In this case it is mandatory to replace the silver ionization cartridge with a new one**.

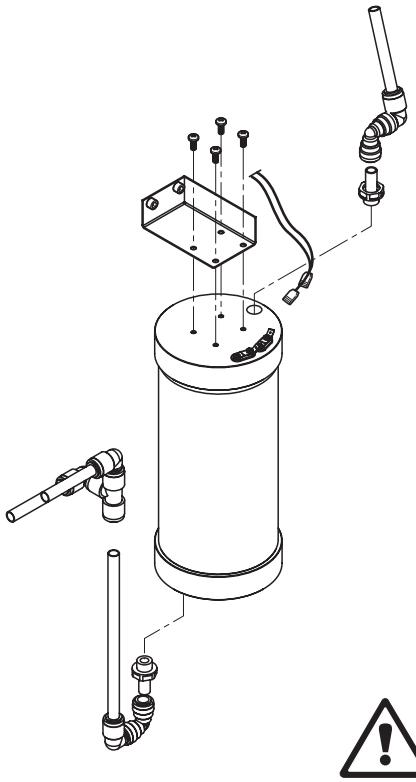
Ag electrode change due

error 12 Ag ion

If you do not reset the message “Ag electrode change due” (see below), the unit is automatically powered off after about one week of operation and the display alternately shows the two opposite messages (also refer to chapter 7.1 “Error messages”).

Resetting the capacity counter

Following the replacement of the silver ionization cartridge the **capacity counter** needs to be **reset** as follows:
Press and hold both arrow keys key while switching the control unit on. Keep both arrow keys depressed (approx. 5 seconds) until the **red error LED goes off** and then comes on again briefly (approx. 1 second).



Replacing the silver ionization cartridge

- Set the hybrid humidifier Condair Dual **out of operation** as per chapter 5.3 and **depressurize the water system**.
- Remove the two electrical connectors from the connections on the silver ionization cartridge.
- Loosen the hose connectors at the entry and the exit, then remove both screw-in nipples.
  Caution! The silver ionization cartridge is filled with fully demineralized water. Place a bucket under the cartridge before loosening the connections.
- Undo the four screws fastening the silver ionization cartridge to the holder, then remove the cartridge.
  Caution! The empty silver ionization cartridge weighs approx. 3 kg (6.5 lb).
- Install the new silver ionization cartridge in the reverse order.

Caution! Exhausted silver ionization cartridges **must be sent to the local Condair representative for correct disposal**.

6.5 Replacement of the control unit fuses

The fuses of the control unit must be replaced by **authorized personnel only** (e.g. electrician).

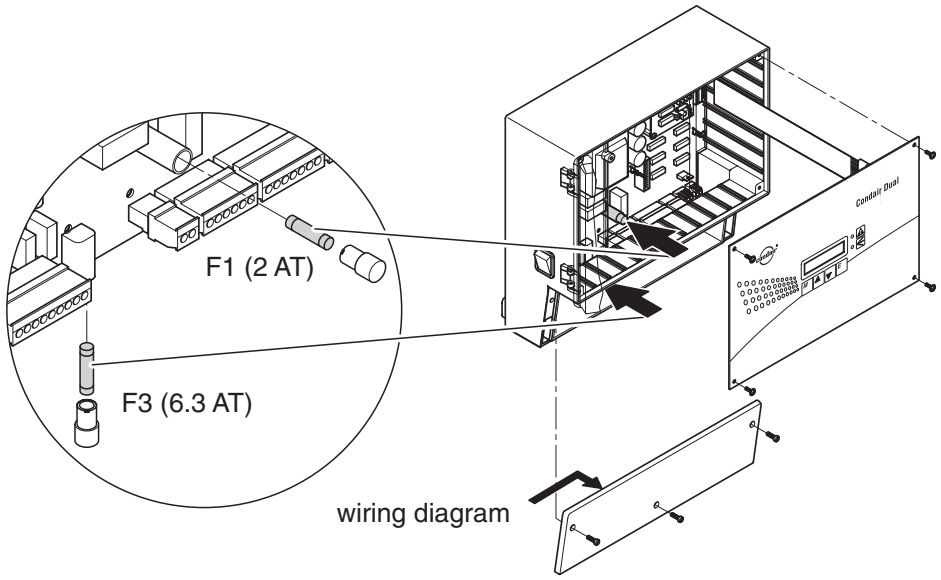
Caution! Electronic components are sensitive to electrostatic discharge. Protective measures (**ESD protection**) must be taken before replacing the fuse(s) of the control unit.

Replace **fuses F1 and F3 of the control unit** only with fuses matching the specifications below:

– Fuse F1: fuse type: 2 A, slow-blow

– Fuse F3: fuse type: 6.3 A, slow-blow

Caution! Never use refurbished fuses. Do not bridge the fuse holder.



7 What if ...?

7.1 Error messages

Faults detected during operation trigger the **fault indicator** (red LED) and a corresponding **event message** appears on the display. The Condair Dual makes a distinction between **alarms** and **errors**.

Alarms

An alarm indicates a temporary fault that was detected during operation (short-time interruption of the water supply) or faults that do not cause damage to the system. **If the source of trouble disappears within 30 minutes, the alarm is reset automatically**. Otherwise, the system issues a corresponding error message.

Indication: red LED flashes (once a second)
alarm message appears on the display

Example:

Alarm message	Cause/Remedy
alarm 04 limit permeate	Cause: Permeate conductance (limit) required for stopping permeate flushing is not reached even after extended flushing. Remedy: Check reverse osmosis system.
alarm 07 min.press. perm.	Cause: Pressure at fully demineralized water connector of booster pump is too low (cause: water conduit too narrow, reverse osmosis system too small or too many consuming devices connected to reverse osmosis system). Remedy: Check reverse osmosis system and fully demineralized water supply conduit. Pressure at fully demineralized water connector must be at least 2 bar (working pressure). Install larger supply conduits (min. inner ø 15 mm). This message appears only if the system is equipped with built-in booster pump!
alarm 08 max.press. perm.	Cause: Admissible maximum pressure of permeate exceeded. Remedy: Check reverse osmosis system and/or setting of booster pump. Integrate a pressure regulator into the supply line.
alarm 09 permeate temp.	Cause: Operating temperature of booster pump is too high or flat ribbon cable between power supply PCB and CPU PCB (inside the control unit) is disconnected or defective. Remedy: Check booster pump. Plug in flat ribbon cable or replace cable, as required. Reduce temperature of fully demineralized water supply (max. 45 °C).
alarm 10 Ag ion current	Cause: Nominal value of ionization current not reached (cable defective or disconnected, silver electrodes worn). Remedy: Check/Re-establish electrical connection of silver ionization. Replace silver ionization cartridge (see chapter 6.4).

Alarm message	Cause/Remedy
alarm 11 Ag ion test	Cause: At the daily Ag ion test the maximum ionization current could not be reached because the silver electrodes are partially or fully worn. Remedy: Replace silver ionization cartridge (see chapter 6.4).

Errors

An error message indicates a fault detected during operation that may cause damage to the system. If such a fault occurs, the Condair Dual is **switched off automatically**.

Indication: red LED lights constantly
error message appears on the display

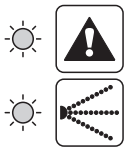
Example:

error 10
Ag ions current

If the fault indicator (red LED) and the "Humidification on" indicator (green LED) light up intermittently, the **external safety circuit** (maximum hygrostat, flow control, etc.) is interrupted.

Example:

ext.safety chain
interrupted



Notes:

– An error message always overwrites a preceding alarm message.

– The first error message remains in the display even if subsequent faults occur.

Following elimination of the source of trouble the error message may be reset **by switching the control unit off and back on again**.

Fault message	Cause/Remedy
error 01 CPU	Cause: Electronic component (RAM, watchdog, EPROM, EEPROM) on CPU PCB defective. Remedy: Replace CPU PCB.
error 02 int.safety chain	Cause: Internal safety circuit interrupted: power supply PCB defective, flat ribbon cable between power supply PCB and CPU PCB disconnected or defective. Remedy: Replace power supply PCB, plug in flat ribbon cable or replace cable, as required.
error 03 analog entry	Cause: Signal at analog input out of preset range. Remedy: Select correct range of analog signal input. Check connected sensor or controller and replace, as required.

Fault message	Cause/Remedy
error 05 conduct. perm.	Cause: Conductance limit exceeded (>100 µS/cm). Remedy: Check reverse osmosis system (max. conductance 15 µS/cm), check conductance sensor and clean, if required.
error 06 cond.meas. perm.	Cause: Permeate conductance out of admissible range of tolerance (conductance sensor disconnected or short-circuited). Remedy: Check reverse osmosis system. Connect conductance sensor on connector box, check wiring.
error 10 Ag ion current	Cause: Nominal or maximum value of silver ionization current is not reached (error message 10 present for more than a week). Remedy: Check/plug in connection cables of silver ionization unit. Replace silver ionization cartridge. Measure ionic current at 100% humidifying capacity and compare to setup value.
error 11 Ag ion test	Cause: At the daily Ag ion test the maximum ionization current could not be reached because the silver electrodes are partially or fully worn (error message 11 present for more than a week). Remedy: Replace silver ionization cartridge (see chapter 6.4).
error 12 Ag ion	Cause: The silver ionization cartridge was not replaced although the message “Ag electrode change due” has been present for more than a week, or the capacity counter was not reset following the replacement of the cartridge. Remedy: Replace silver ionization cartridge and/or reset the capacity counter (see chapter 6.4).
error 13 sensor	Cause: If the internal controller is activated and the humidity signal of the connected humidity sensor is below 5% for more than 10 minutes the connection to the sensor is interrupted or the humidity sensor is defective. The internal controller is activated although an external controller is connected. Remedy: Check connection cable, humidity sensor and control signal setting or replace humidity sensor. Disable the internal controller if an external controller is connected.

7.2 Failures

The following table presents failures that do not trigger an error message, together with indications on their cause and notes on how to eliminate the sources of trouble.

Failure	Cause	Remedy
Residual water in the section of the duct outside the water tub	Sealing elements improperly installed or defective.	Mount sealing elements correctly or replace, as required.
	Post-evaporation elements improperly installed or ceramic plates broken.	Mount ceramic plates correctly or replace, as required.
	Air velocity in the duct is too high (systems without booster >2.5 m/s, systems with booster >4 m/s).	Reduce air velocity in the duct, if possible, or install booster (consult your Condair supplier beforehand).
Condair Dual humidifies permanently	Nominal value of humidity is too high.	Set nominal value correctly.
	Ambient humidity very low.	Wait.
	The internal sensor of the control unit is active although an external sensor is connected.	Deactivate the internal sensor of the control unit (see chapter 5.5).
Spray valves open and close continually	Unstable controller signal.	Check controller settings and adjust controller, as required.
Maximum humidification capacity is not reached	Output limitation active.	Deactivate output limitation (see chapter 5.5).
	System incorrectly dimensioned (insufficient capacity).	Contact your Condair supplier.
	Booster pump defective (insufficient permeate pressure).	Replace booster pump.
Booster pump starts too late or not at all	Output limitation active and/or selected starting point of booster pump is too high.	Deactivate output limitation (setting: 100%, see chapter 5.5) and/or adjust starting point of booster pump (call service technician).
	Fuse F3 blown.	Replace fuse.
Pressure at the manometer of the connector box drops to 0 bar during operation	Water hose(s) between spray valves and spray nozzles (or hoses inside the duct) disconnected.	Attach water hose(s).
	Working pressure is too low.	Check reverse osmosis system and fully demineralized water supply conduit.
Spray valve Y6 (stage 1) and/or spray valve Y7 (stage 2) do not open	Spray valve Y6 and/or spray valve Y7 defective.	Replace spray valves.
	Output limitation active.	Deactivate output limitation (setting: 100%, see chapter 5.5).

Failure	Cause	Remedy
Spray valve Y8 (option Z407) does not open (not even at 100% humidification request).	Spray valve Y8 defective or not activated in the control system.	Contact service provider.
The humidifier is automatically powered down after about one week of operation.	Ag ionization defective or exhausted. Capacity counter run-out.	Replace silver ionization cartridge and/or reset the capacity counter.

7.3 Instructions for fault elimination

- When eliminating faults, the Condair Dual Hybrid Humidifier must be taken out of operation (see chapter 5.3).
  Danger! Make sure the mains supply to the control unit is disconnected (check with voltage tester) and the shut-off valve of the water supply is closed.
- Have faults eliminated by adequately qualified and trained personnel only.
  Malfunctions caused by the electrical installation must be repaired by authorized personnel only.
- **Caution!** Electronic components are very susceptible to electrostatic discharge. When carrying out repairs to the control unit, appropriate measures (ESD-protection) must be taken to prevent damage to electronic components.
- Malfunction of the booster pump must be remedied **by your Condair supplier only**.

8 Specifications/ambient conditions

	Type	Capacity in l/hr at 7 bar water pressure	Type	Capacity in l/hr at 7 bar water pressure
Scope of versions in terms of capacity	CD ZE / DZ 20 CD ZE / DZ 40 CD ZE / DZ 60 CD ZE / DZ 80 CD ZE / DZ 100 CD ZE / DZ 120 CD ZE / DZ 160 CD ZE / DZ 200	20 40 60 80 100 120 160 200	CD ZE / DZ 300 CD ZE / DZ 400 CD ZE / DZ 500 CD ZE / DZ 750 CD ZE / DZ 1000	300 400 500 750 1000
Power consumption (with booster pump)	155 VA		335 VA	
Mains supply (to control unit)	200…240 VAC/50…60 Hz			
Voltage of solenoid valves (Y5-Y8)	24 VDC extra-low voltage			
Number of steps (humidity control)	3-step (7-step with option Z406)			
Resolution of humidity control	33 % (14.2 % with option Z406)			
Control accuracy [1]	3-step: ±10 % / 7-step (option Z406): ±4 %			
Control signals – active – passive	0…20 VDC (phase-control), 0…10 VDC, 0…8.25 VDC, 1…5 VDC, 0…5 VDC, 0…1 VDC, 0…20 mA, 4…20 mA all potentiometric humidity sensors from 1…10kΩ			
Central unit – Weight – Dimensions HxWxD	18,5 kg (Z409: 39,0 kg)		22,7 kg (Z409: 43,2 kg)	
	951 x 693 x 220 mm (Z409: 600 x 600 x 210 mm and 300 x 500 x 210 mm)			
Ceramic plate sizes	6			
Maximum air velocity in duct	2,5 m/s (without booster) 4 m/s (with booster)			
Max. admissible supply air temperature	50 °C (before humidifier)			
Water supply – connector – pressure – water temperature – water quality requirements	1/2" (outside thread), nominal width 15 mm working pressure 2…10 bar max. 45 °C fully demin. water 0.5...15 µS/cm (**without any additives**), max. 1000 cfu/ml			
Water drain connector (drain valve)	hose stem, outer ø16 mm or G 1/2" outside thread (Z409)			
Water connector of humidifier	plug-in system (ø10 mm)			
Nozzle pressure	4…10 bar			
Nozzle sizes	4 (2.46 l/h, 3.10 l/h, 4.0 l/h, 5.0 l/h)			
Monitoring of fully demineralized water	min. pressure, max. pressure, conductance, temperature of booster pump			
Admissible ambient temperature [2]	1..40 °C			
Admissible ambient humidity [2]	max. 75 %rh non-condensing			
Test and conformity certificates	CE label			
System of protection – control – central unit – central unit in protective cabinet (Z409)	 IP 31 IP 30 IP 54			
Options	remote operating and fault indication “Z401” or “Z401S” (wire breakage safe), RS 232/485 interface “Z404”/“Z405”, casing central unit “Z408”, central unit in protective cabinet “Z409”			

[1] The nominal control accuracy may not always be available, because various factors (temperature control, water recycling, flap valve systems, etc.) may affect the accuracy.

[2] Control and central unit

9 Appendix

9.1 Notes on humidity control

9.1.1 Notes on humidity control with the internal PI controller

The internal PI controller of the Condair Dual Hybrid Humidifier

The controller built into the Condair Dual Hybrid Humidifier is a so-called PI controller (proportional-integral controller). The PI controller interprets the analog signal as the actual humidity value captured by a sensor and controls the humidification capacity via the “proportional range” and “integral time” parameters.

– **Proportional range** (P-range)

  The proportional range is used to smoothen the control characteristic. The larger the selected P-range, the smoother the control characteristic will be. However, this results in a permanent control deviation (from the preset nominal value), proportional to the bandwidth of the P-range.
  Note: Minor deviations may be compensated by optimal coordination with the integral time parameter.

– **Integral time**

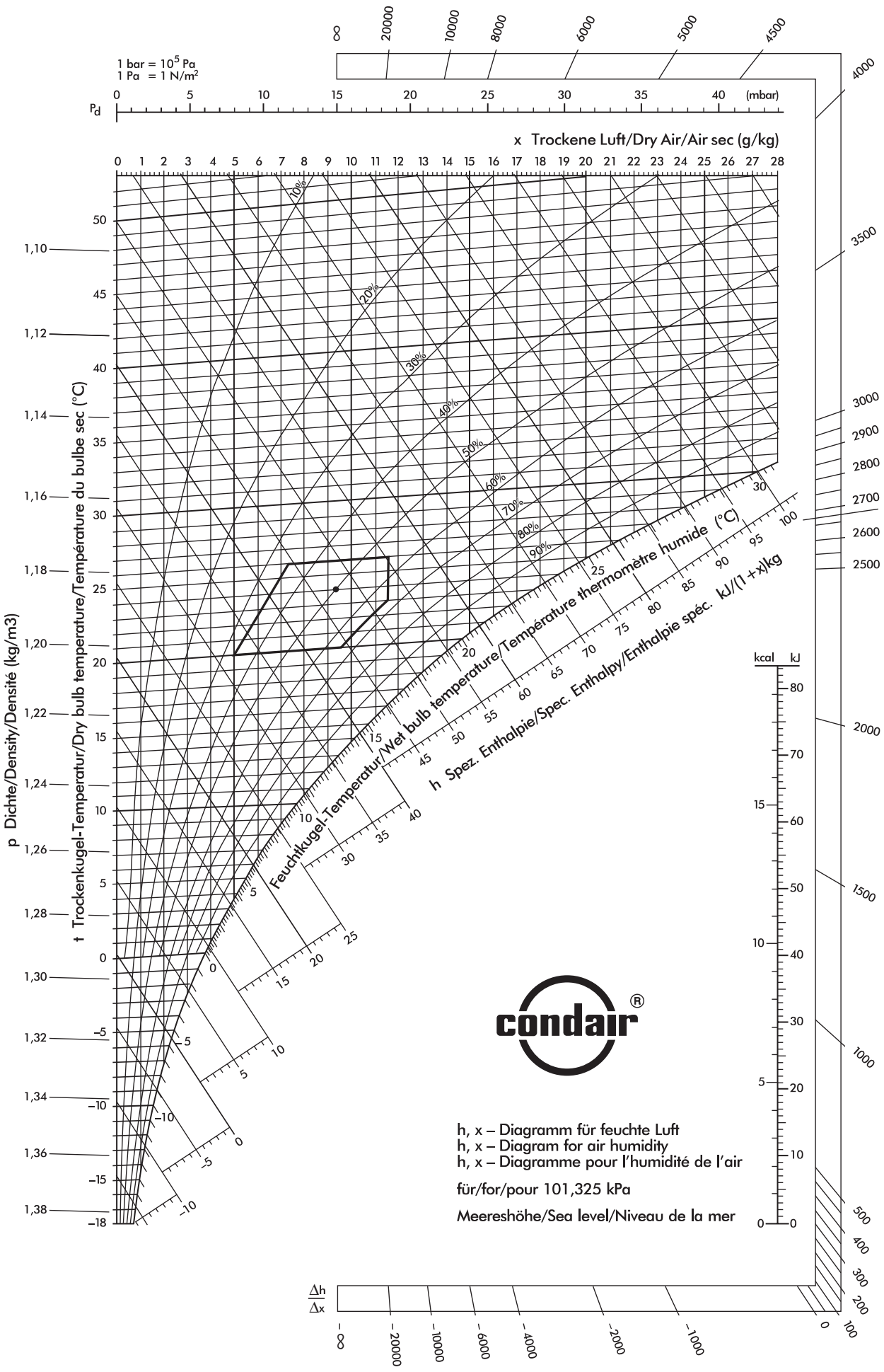
  The integral time setting determines the period allowed to balance the deviation of the control (due to the P-range) and to reach the nominal value. The greater the integral time setting, the longer it takes to reach the nominal humidity (providing better accuracy).
  The smaller the integral time value, the faster the nominal humidity will be reached (reduced control accuracy).

Controller settings

No general advice can be given on how to adjust the built-in PI controller of the Condair Dual Hybrid Humidifier (P-range and integral time settings) because every control distance (distance between humidifier and measuring spot) presents a particular degree of difficulty in terms of adjustment. However, the following rules may be used as a guideline when adjusting the PI controller:

- Always start from the **factory settings**.
- In case control requires fine-tuning:
  - Change values in **small steps only**.
  - Always modify the **P-range first**.
  - **Never alter** the P-Range and integral time settings **simultaneously**.

h,x diagram


1 bar = 10^5 Pa
1 Pa = 1 N/m²
Pd
(mbar)
x Trockene Luft/Dry Air/Air sec (g/kg)
t Trockenkugel-Temperatur/Dry bulb temperature/Température du bulbe sec (°C)
p Dichte/Density/Densité (kg/m3)
Feuchtkugel-Temperatur/Wet bulb temperature/Température thermomètre humide (°C)
h Spez. Enthalpie/Spec. Enthalpy/Enthalpie spéc. kJ/(1+x)kg
kcal
kJ
condair
h, x – Diagramm für feuchte Luft
h, x – Diagram for air humidity
h, x – Diagramme pour l'humidité de l'air
für/for/pour 101,325 kPa
Meereshöhe/Sea level/Niveau de la mer
Δh/Δx

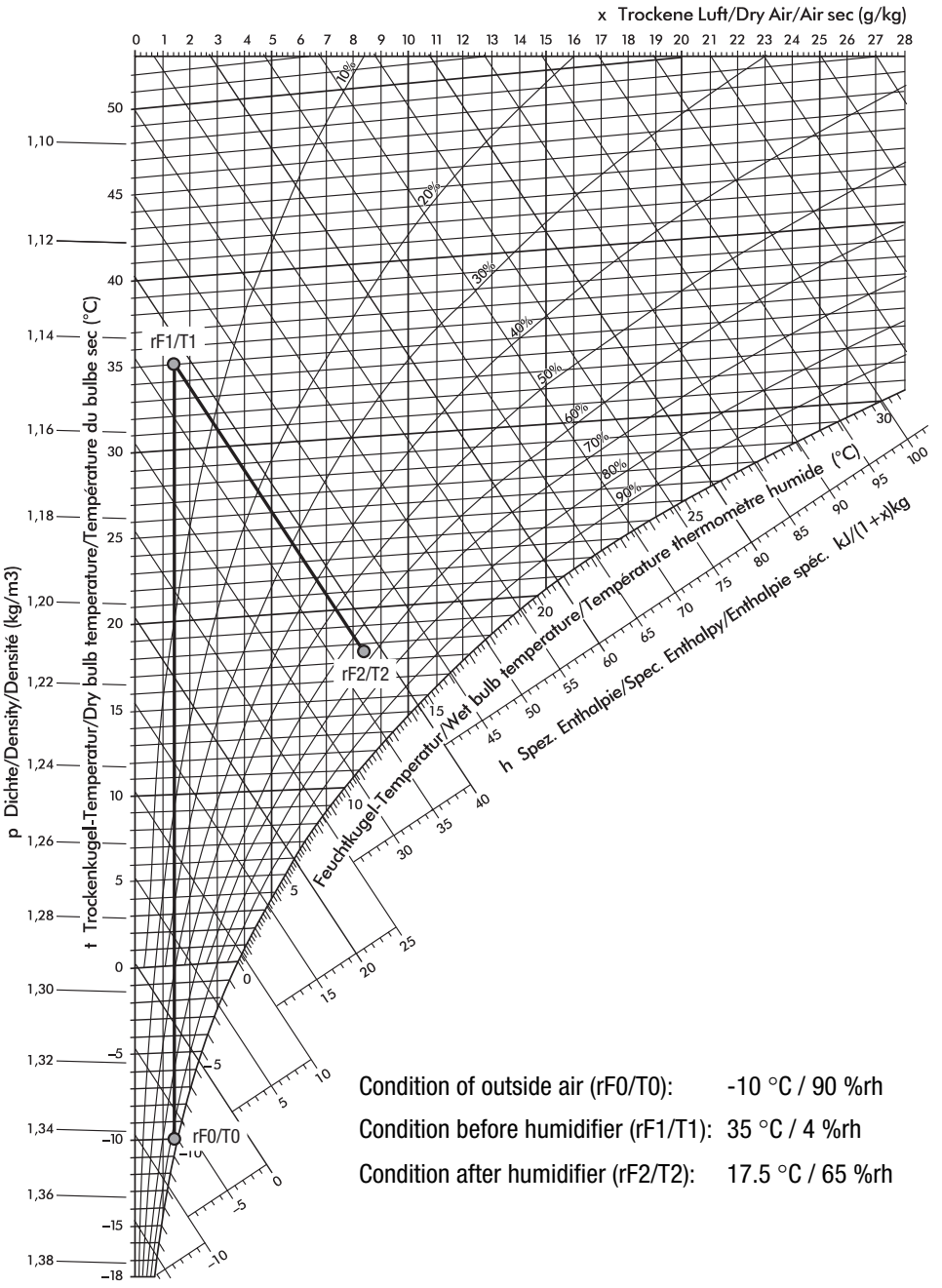
9.1.2 Enthalpy control for Condair Dual

For accurate and energy saving air conditioning an enthalpy control is recommended. In simple terms, enthalpy is the amount of energy of the air in kJ/kg. With an enthalpy control the air temperature and the air humidity are used to control the preheater in a way, that the Condair Dual can be exactly and continuously regulated along the adiabatic line to the respective outlet conditions (rF2 and T2). With an enthalpy control a reheater is not needed.

Important! A dew point control which uses the dew point as regulation parameter in conjunction with a preheater and an air humidifier and where the desired air temperature is achieved with a reheater is not suitable.

If another control system than the enthalpy control should be used please contact your Condair representative.

Example of an enthalpy control for Condair Dual


x Trockene Luft/Dry Air/Air sec (g/kg)
p Dichte/Density/Densité (kg/m3)
t Trockenkugel-Temperatur/Dry bulb temperature/Température du bulbe sec (°C)
Feuchtkugel-Temperatur/Wet bulb temperature/Température thermomètre humide (°C)
h Spez. Enthalpie/Spec. Enthalpy/Enthalpie spéc. kJ/(1+x)kg
rF1/T1
rF2/T2
rF0/T0

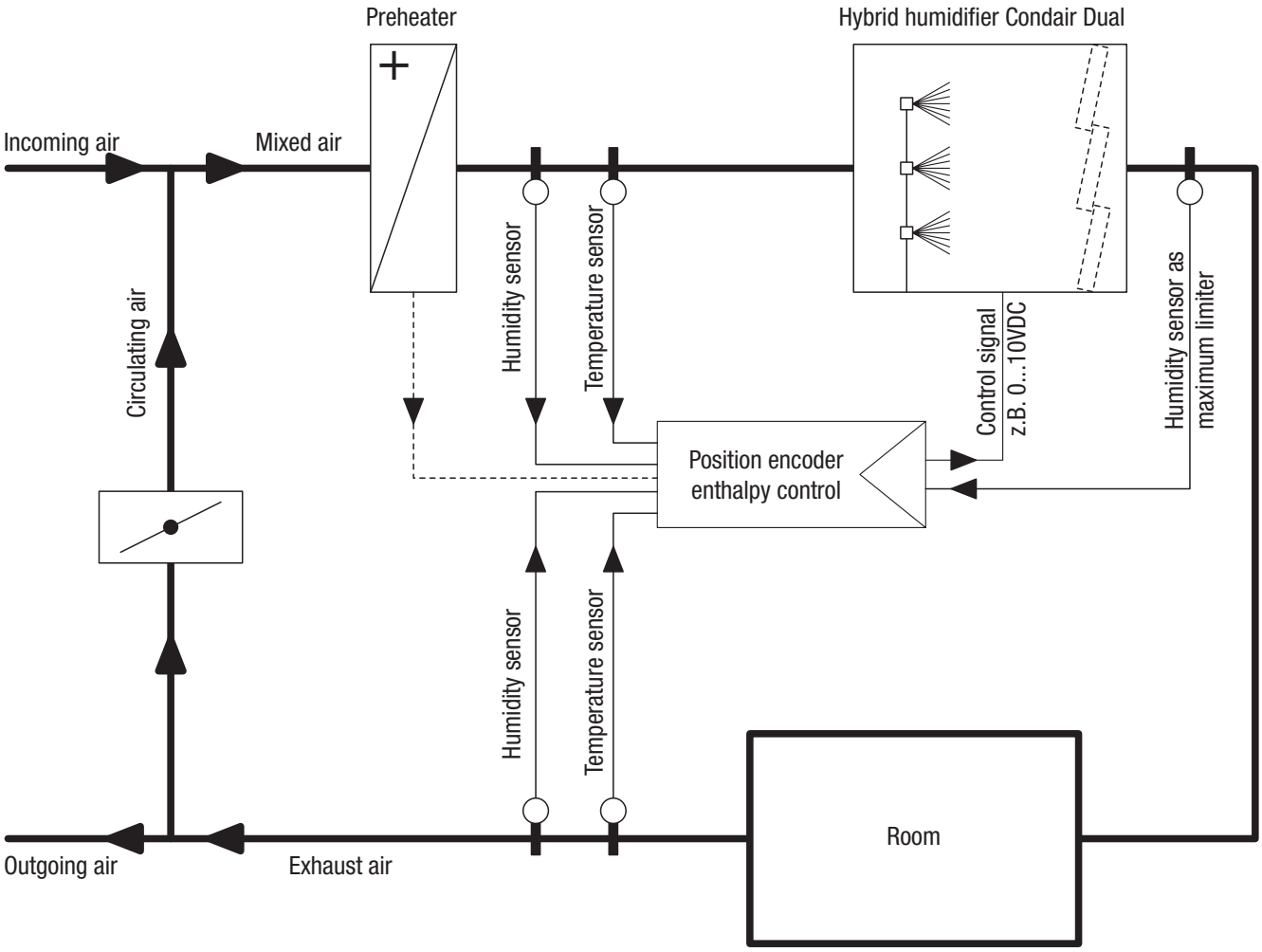
Condition of outside air (rF0/T0): -10 °C / 90 %rh

Condition before humidifier (rF1/T1): 35 °C / 4 %rh

Condition after humidifier (rF2/T2): 17.5 °C / 65 %rh

Basic diagram of an enthalpy control

Remark: If the temperature is changed at the preheater, the humidification of the air which can be reached by the humidifier must be adapted to the new temperature before the humidification unit. When adapting, make sure the **efficiency factor of the humidifier system** "η" is not exceeded according the following formula.



$$\eta = \frac{\mathbf{(x2\text{-}x1) \bullet 100}}{\mathbf{xS\ \text{-}x1}}\ \%$$

9.2 Declaration of conformity

We herewith declare under our sole responsibility that the **"Condair Dual 2" Hybrid Humidifiers of the "CD ZE ..." and "CD DZ ..." series** comply with the standards on electromagnetic compatibility according to: EN50082-2:1995 and prEN 50082-2:1996.

Axair Ltd.

Pfäffikon, December 22, 1997

9.3 Commissioning protocol/Maintenance record

On the following two page you will find:

– the "Commissioning protocol" holding the current operating parameters

– the "Maintenance record" specimen (to be copied)

AxAir

Condair Dual 2

Commissioning protocol

Name of test engineer		Starting point of booster pump [%]	
Date		Booster pump at flushing on / off?	
Time		Silver ionization off / on?	
Client		Ionization current, actual / nominal value [mA]	/
Contact/supporter		Remaining capacity of silver electrodes [Ah]	
Location of humidifier/internal number		Working hours [h]	
Type of monoblock		Next maintenance [h]	
Unit type Condair Dual		Controller on / off?	
Serial number		Nominal humidity value (only if controller is active) [%rh]	
Location of central unit		P-range (only if controller is active) [%]	
Number of control steps (3-step or 7-step)		Integral time (only if controller is active) [min]	
Type of control signal		Output limitation [%]	
Measured mains voltage [V]		Analog signal range	
Nominal humidification output [kg/h]		Error history	/ / / /
Actual humidification output [kg/h]		Software version	
Signal at analog input [%]		Working pressure at full load, w/o pump [bar]	
Booster pump internal/external?		Working pressure at full load, with pump [bar]	
Permeate conductance [µS/cm]		Hose connectors leak-proof?	
Permeate limit [µS/cm]		Booster pump leak-proof?	
Output of spray valve Y6 [kg/h]		Nozzle connections leak-proof?	
Output of spray valve Y7 [kg/h]		Monoblock leak-proof?	
Output of spray valve Y8 [kg/h]		Routing of drain Y5 ok?	
		Height of drain (siphon trap) at monoblock ok?	

Notes:

AxAir

Condair Dual 2

Maintenance record

Unit type	Serial number	Commissioning	Software version	Location	Responsible	Internal no.

Date	Time	H_2O permeate [l]	Permeate conductance [µS/cm]	Remain. cap. silver electr. [Ah]	Working hours [h]	Next maintenance [h]	Error history	Remarks	Signature

9.4 Setup table silver ionization “Hygieneplus”

Setup of ionization current and capacity counter

Capacity of unit [l/h]	**20**	**30**	**40**	**60**	**80**	**100**	**120**	**125**	**140**	**160**	**180**	**200**	**220**
Type of silver ionization cartridge “Hygieneplus”	30	30	60	60	125	125	125	125	250	250	250	250	250
Ionization current [mA]	1.0	1.0	1.2	1.8	2.4	3.0	3.6	3.8	4.2	4.8	5.4	5.8	6.4
Capacity counter [Ah]	3.6	3.6	7.4	7.4	14.6	14.6	14.6	14.6	29.2	29.2	29.2	29.2	29.2

Capacity of unit [l/h]	**240**	**250**	**260**	**280**	**300**	**320**	**340**	**360**	**380**	**400**	**420**	**440**	**460**
Type of silver ionization cartridge “Hygieneplus”	250	250	500	500	500	500	500	500	500	500	500	500	500
Ionization current [mA]	7.0	7.4	7.6	8.2	8.8	9.4	10.0	10.6	11.2	11.8	12.4	12.8	13.4
Capacity counter [Ah]	29.2	29.2	58.4	58.4	58.4	58.4	58.4	58.4	58.4	58.4	58.4	58.4	58.4

Capacity of unit [l/h]	**480**	**500**	**550**	**600**	**650**	**700**	**750**	**800**	**850**	**900**	**950**	**1000**
Type of silver ionization cartridge “Hygieneplus”	500	500	500	500	500	500	500	500	500	500	500	500
Ionization current [mA]	14.0	14.6	16.2	17.6	19.0	20.4	22.0	23.4	24.8	26.4	27.8	29.2
Capacity counter [Ah]	58.4	58.4	58.4	58.4	58.4	58.4	58.4	58.4	58.4	58.4	58.4	58.4

© Axair Ltd. 2005, Printed in Switzerland
Technical data subject to modification

Reg.No. 40002-2

Consulting, Sales and Service:

Manufacturer:
Axair Ltd.
a WMH Company
Seleko AB - Box 143 - 137 22 Västerhaninge
Telephone +46 8 504 105 60, Fax +46 8 504 105 61
Internet http://www.seleko.se, E-Mail info@seleko.se

condair®